4 ASSESSMENT RATIO STUDIES

The assessor has the difficult task of preparing an annual assessment roll that accurately reflects the value of all taxable property within the jurisdiction. The assessor is charged with valuing real property (with the exception of agricultural land) at market value. Market value is defined as:

> "The most probable price which a property should bring in a competitive and open market under all conditions requisite to a fair sale, the buyer and seller each acting prudently and knowledgably, and assuming the price is not affected by undue stimulus. Implicit in this definition are the consummation of a sale as of a specified date and the passing of title from seller to buyer whereby:
>
> 1. Buyer and seller are typically motivated;
> 2. Both parties are well informed or well advised and acting in what they consider their own best interests;
> 3. A reasonable time is allowed for exposure in the open market;
> 4. Payment is made in terms of cash in U.S. dollars or in terms of financial arrangements comparable thereto; and
> 5. The price represents the normal consideration for the property sold unaffected by special or creative financing or sales concessions granted by anyone associated with the sale."
>
> *(IAAO Standard on Ratio Studies 2007* and *Title XI FIRREA 1990)*

The property tax system is fair and equitable when the assessor produces accurate assessments. The accuracy of appraisals that form the basis for assessments is, therefore, of great concern to the assessor, property owners, political subdivisions (taxing entities), elected officials, and the State Tax Commission. The State Tax Commission Ratio Studies are the fundamental instruments used to measure the accuracy of assessments of real property.

4.1 MISSOURI RATIO STUDY'S REQUIREMENTS & CONCEPTS

Ratio studies determine the level of assessment by comparing the assessor's value to a market value proxy. The county's assessment is compared to the sale price for recent transactions (sales ratio study) or the county's assessment is compared to an independent appraisal (appraisal ratio study.) Both are recognized procedures to determine if property tax assessments are fair and equitable.

Ratio studies have a variety of uses. At the local level, they can be used to:

1. Monitor assessment performance and thereby identify potential problems with assessment procedures;
2. Improve assessment equity by monitoring the overall level of assessment and the degree of dispersion;
3. Indicate the need for a general reappraisal, or a selective reappraisal of certain property types, groups or neighborhoods; and
4. Assist in market analysis.

At the state level, they can be used:

1. To monitor assessment accuracy;
2. For inter-county and intra-county equalization;
3. To distribute intergovernmental funds, such as the distribution of state funds to local school districts;
4. To determine the need for a general reassessment;
5. To establish priorities for reappraisal of selected groups of properties;
6. To compute an estimate of the market value of taxable property within a jurisdiction;
7. To adjust appraisals for centrally assessed properties; and
8. To evaluate claims of discrimination within the assessment function.

The end product of a ratio study is that the descriptive statistics allow the analyst to summarize the status of the valuations and to draw conclusions about the tested population.

4.1.1 BACKGROUND

As early as 1955 the general assembly created statutes that required the State Tax Commission to determine the general level of assessment in each of the state's 114 counties and the City of St. Louis. Over the years, a number of methods have been employed to establish assessment ratios through varying endeavors and with varied results.

In 1975, the State Auditor conducted a statewide sale ratio study to measure the assessment levels of the 114 counties and the City of St. Louis. The study showed a range of ratios from a low of 6.2% to a high of 46.7%. The problems inherent in a one-year sale ratio study subjected the study to considerable criticism; but if nothing else, the report served to point out the fact that there were obviously large disparities among the assessment levels of the counties. As a result of these studies, the legislature directed the Commission to formulate a supportable program to be used to measure the accuracy of the assessment process throughout the state.

In 1977, the Commission contracted with the Arthur Young & Company to develop a methodology for conducting ratio studies that was statistically valid and would assist the Commission in fulfilling its responsibilities and objectives of monitoring the property tax system.

In 1979, the State Supreme Court, in Cassily vs. Riley, ordered the Commission to conduct a statewide reassessment. Subsequently each county was directed to plan and implement a reassessment program in order to eliminate the deficiencies in the assessment process.

In 1985, the Commission contracted with the University of Missouri-Columbia to review the Commission's ratio study methodology and to recommend changes. The analysis found the policies and procedures of the state's study to be consistent with accepted statistical practices. The policies, procedures, and methodology of conducting the studies were also found to be in compliance with the "Standard on Ratio Studies" as published by the International Association of Assessing Officers (IAAO).

In 2006, the Commission contracted with the IAAO to re-examine the policies, procedures and

methodology of the Commission's ratio study and to recommend improvements that would allow the Commission to better evaluate the state's level of assessment and to provide improved guidance to county assessors to ensure that assessments remain current.

In 2007, the Commission began using sales ratio studies for residential property, including the Traditional Sales Study and the Progressive Hybrid Study. These sales ratio studies replaced the appraisal ratio studies in counties that showed quality sales databases, historically and prospectively.

4.1.2 RESPONSIBILITIES AND OBJECTIVES

The State Tax Commission of Missouri, as the oversight agency of the assessment function in Missouri, is charged with the responsibility of monitoring the assessment accuracy in each of the 114 counties and the City of St. Louis. This is accomplished by a biennial Assessment Ratio Study.

The current analysis is based upon the accepted concepts for statistically valid studies.

- Sales studies measure marketable subsets of the entire population and are tested for reliability and adherence to professional standards.
- Appraisal studies employ a simple random, representative sample. The sampling methodology currently employed by the Commission identifies the population within each county and subclass. From this population, a random sample is drawn. Appraisals are then completed by the Commission's staff appraisers to estimate the Market Value for the property. A minimum of thirty parcels are appraised in each subclass.
- Hybrid studies combine sales and appraisals for overall results.

The objective is to accurately estimate the overall level of assessment, for each specified subclass of property, to determine compliance with constitutional, statutory, and departmental rule requirements.

4.1.3 TWO YEAR RATIO STUDY CYCLE

In 1989, the Commission implemented a two (2) year ratio study cycle in place of the annually conducted study. Under this scenario, a study of each subclass within a county is to be completed during one (1) of the two (2) years of the study cycle. Previously, all subclasses in each of the 115 jurisdictions were completed each year.

Beginning with the 2001 two-year cycle, agricultural studies were scheduled for completion every six years. That is, one-third of the agricultural subclass studies were scheduled for completion during each two year cycle. This practice was deemed necessary due to budget and staffing reductions. Then, in the 2007 cycle, Agricultural ratio studies were suspended altogether due to another round of budget and staff reductions. The reasoning in the Commission's decision lies in the nature of the agricultural assessment process. Agricultural land is assessed based on "use value" not market value as are residential and commercial real estate. The grading and classification of agricultural land is based on observations of the topography, potential for flooding, tree cover and the quality and productivity of the underlying soil. The productivity

rating for developing these classifications does not consider the market value of the land; therefore an increasing land value does not translate to an increase in land productivity. Since there is less likelihood of rapid changes in agricultural use value, the original decision to spread these studies over a longer time-frame was a reasonable. Paramount in the decision to suspend studies in 2007 is the stable nature of agricultural property with minimal changes over time, and consideration of the cost benefit analysis, wherein the required resources to do appraisal studies greatly exceeds any notable impact on the assessment process. Agricultural real property accounts for approximately 2.5% of the total real property value in the state. While no Agricultural studies are currently planned, they can still be completed on an "as needed" basis when warranted.

The two-year cycle provides several benefits:

a. It balances the appraisal workload over a two-year period thereby improving the work product. The appraisers have more time to research the market for the data necessary to support their value conclusions.
b. The supplementary time allows for the conducting of additional market studies (land analysis studies, cost studies, depreciation studies, etc.). These and other in-depth studies are most helpful in the proper valuation of real property.
c. It allows an appropriate amount of time to perform sales studies and allows for control groups of sales occurring after the date of value (January 1, odd year).

4.1.4 STATUTORY RATES

Once a property is valued by the county, the property's assessment is calculated. The assessment rates are statutorily set as follows:

Residential property assessments reflect 19% of the property's market value.
Agricultural property assessments reflect 12% of the property's production and/or market value.
Commercial property assessments reflect 32% of the property's market value.

These different assessment rates allocate the burden between the three subclasses of real property.

4.2 RATIO STUDY METHODOLOGY

A brief description of the various ratio studies conducted by the Commission follows. The Commission's studies use both sales and appraisals as proxies of market value. The Commission's Assessment Ratio Study is in compliance with the requirements set forth in the "Standard on Ratio Studies" published by the International Association of Assessing Officers.

4.2.1 RESIDENTIAL RATIO STUDY

Residential assessments are tested every biennial reassessment (once every two years.) There are three types of studies used to determine the level of assessment for residential property.

1. Traditional Sales Study – Valid sales are used to measure fair market value.
2. Progressive Hybrid Study – A comprehensive ratio study to emulate population characteristics using both sales and appraisal study components.
3. Appraisal Study – Approximately 35 properties with a residential assessment are randomly selected and independently appraised.

The analysis of residential assessment values begins with the Reliability Recognition Safeguard. Each jurisdiction submits their sales information to the State. The information received is tested to determine the integrity of the databases and quality of the information that the assessors submit to the State Tax Commission. The county must demonstrate adherence to accepted standards for sales validation and screening. The number of sales must meet sufficient statistical sample size requirements. The count must also represent a realistic turnover rate for the county's residential property. The number of sales must support an adequate pursuit of sales both historically and prospectively. If, for any reason, a county fails the Reliability Recognition Safeguard, the sales study is rejected in favor of a random appraisal study.

4.2.2 AGRICULTURAL RATIO STUDY

Through the 2005 assessment cycle, Agricultural assessments were tested using a random independent appraisal study once every three biennial reassessments (once every six years.) Approximately 35 properties with an agricultural assessment were randomly selected and independently appraised.

Agricultural studies have been suspended since the 2007 assessment cycle.

4.2.3 COMMERCIAL RATIO STUDY

Commercial assessments are tested using a random independent appraisal study. Approximately 35 properties with a commercial assessment are randomly selected and independently appraised.

4.3 DECISION MODEL

The Decision Model is the logical proceedings that occur to determine if a county is in compliance with State Tax Commission criteria for acceptable assessment performance. Assessment programs must meet minimum standards, as determined by the ratio studies. The diagrams which follow are used to determine which studies to perform for each subclass as well as which county assessment programs meet the criteria of the State Tax Commission.

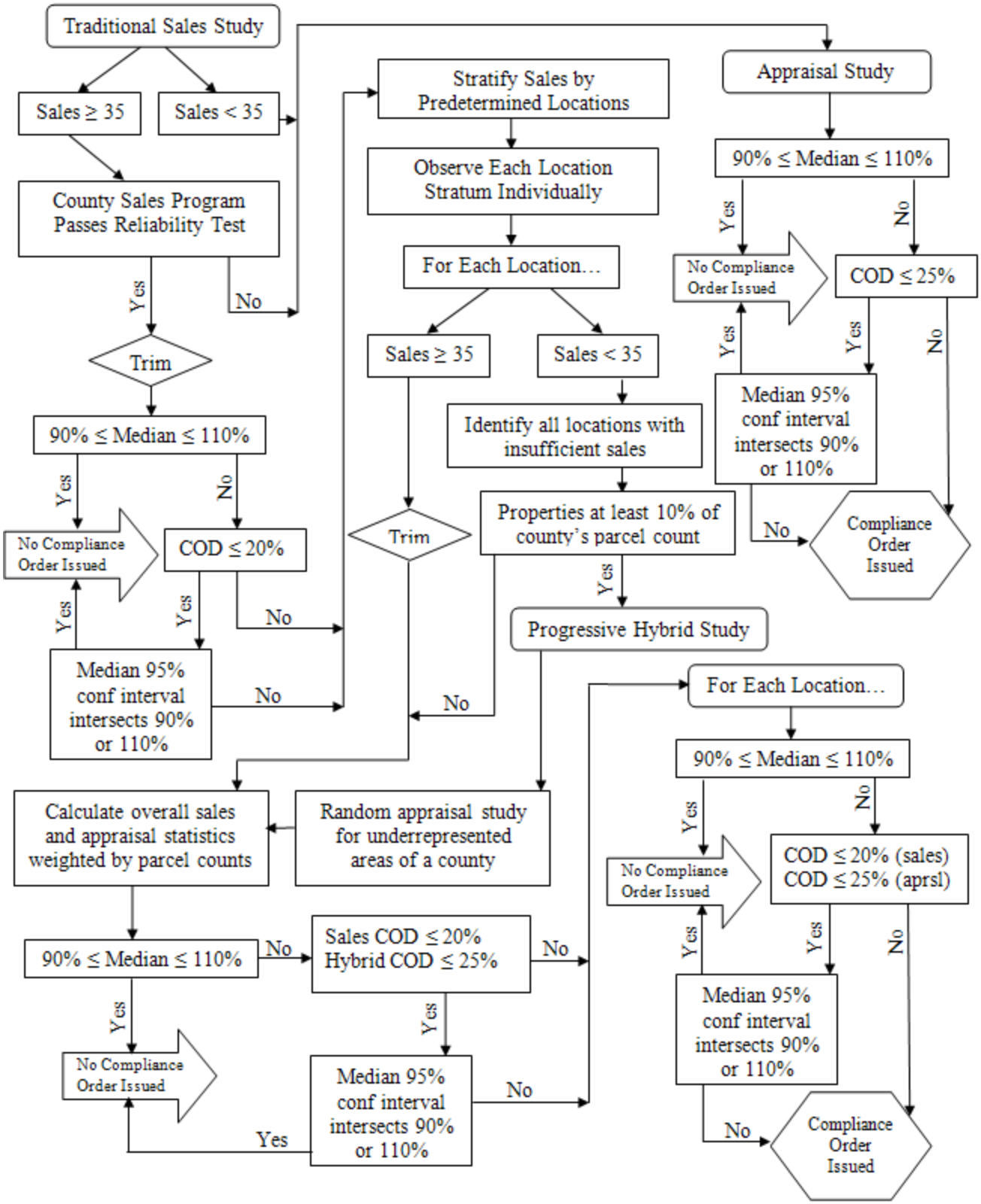
4.3.1 RESIDENTIAL DECISION MODEL

The first step for testing residential property is that the sales collected from the assessors must show acceptable levels of quality. This analysis is known as the Reliability Recognition Safeguard. If the sales are reliable, then the Traditional Sales Study is used as the preliminary study. Otherwise, a random appraisal study is performed for residential property.

A complex diagram has been furnished to illustrate how the decisions for residential property are generated. After the Reliability Recognition Safeguard, the Traditional Sales Study compares sales prices to assessment values. All of the sales with appropriate sale dates are analyzed together. Only properties with strictly residential assessments are used; mixed use properties are excluded. These sales are then trimmed using the Interquartile Range method (3.0 coefficient) with a logarithmic transformation applied to the ratios. This means that outliers (influential ratios) are identified, flagged, and removed using statistically reliable methodologies. Important statistical estimators are reported and used in the decision model.

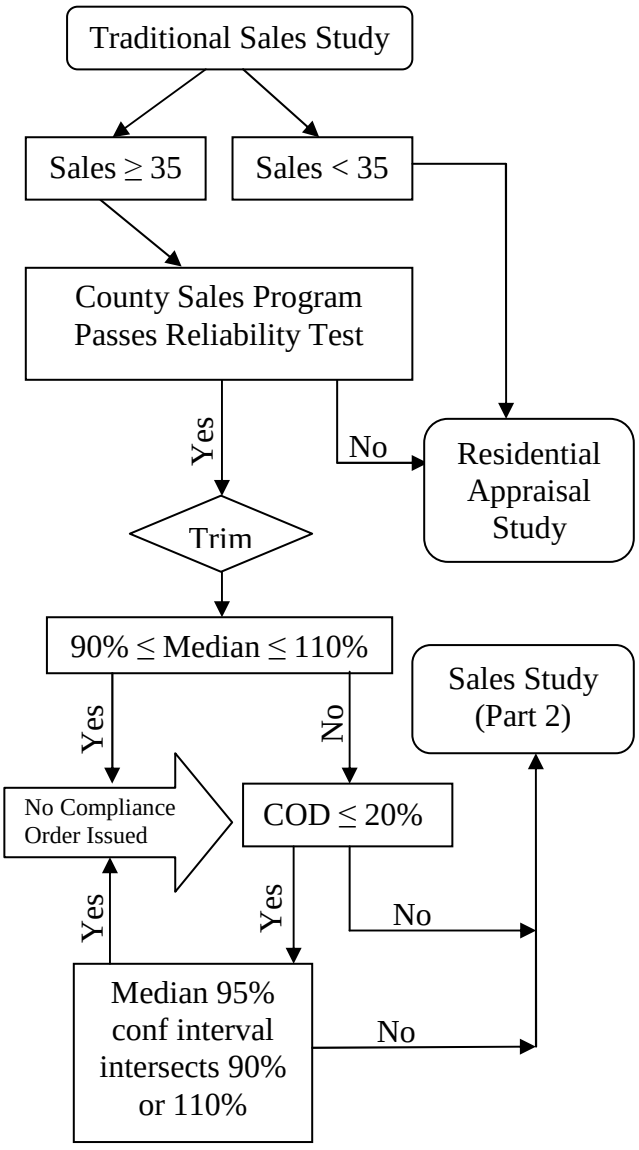
If the Traditional Sales Study shows that the level of assessment is acceptable, then the study is complete. The trimmed overall statistics are accepted as the final, official assessment ratios that are reported. Otherwise, the study continues with location stratification. Prior to the analysis, counties have the option of recommending any geographic stratification for approval. Otherwise, the default geographic location variable will be by school district. The sales are divided into these different regions of the county. The areas are then analyzed using statistical calculations. The statistics from each location are weighted to reflect the number of properties in each area. If these weighted statistics are out of compliance and/or large areas of the county were not considered in the sales study, then the Progressive Hybrid Study is used.

The Progressive Hybrid Study combines all areas of the county, from the location stratification, that had an insufficient sales sample and applies the random appraisal study to those collective areas. The area(s) with sufficient sales and the area(s) represented by appraisals are weighted based on the proportions of the number of properties. These weighted statistics are accepted as the final, official assessment ratios that are reported.


Traditional Sales Study
Sales ≥ 35
Sales < 35
County Sales Program Passes Reliability Test
Yes
No
Trim
90% ≤ Median ≤ 110%
Yes
No
No Compliance Order Issued
COD ≤ 20%
Yes
No
Median 95% conf interval intersects 90% or 110%
No
Stratify Sales by Predetermined Locations
Observe Each Location Stratum Individually
For Each Location…
Sales ≥ 35
Sales < 35
Trim
Identify all locations with insufficient sales
Properties at least 10% of county's parcel count
Yes
No
Progressive Hybrid Study
Appraisal Study
90% ≤ Median ≤ 110%
Yes
No
No Compliance Order Issued
COD ≤ 25%
Yes
No
Median 95% conf interval intersects 90% or 110%
No
Compliance Order Issued
Calculate overall sales and appraisal statistics weighted by parcel counts
Random appraisal study for underrepresented areas of a county
90% ≤ Median ≤ 110%
No
Sales COD ≤ 20% Hybrid COD ≤ 25%
No
Yes
No Compliance Order Issued
Yes
Median 95% conf interval intersects 90% or 110%
No
Yes
For Each Location…
90% ≤ Median ≤ 110%
Yes
No
No Compliance Order Issued
COD ≤ 20% (sales) COD ≤ 25% (aprsl)
Yes
Median 95% conf interval intersects 90% or 110%
Yes
No
No
Compliance Order Issued

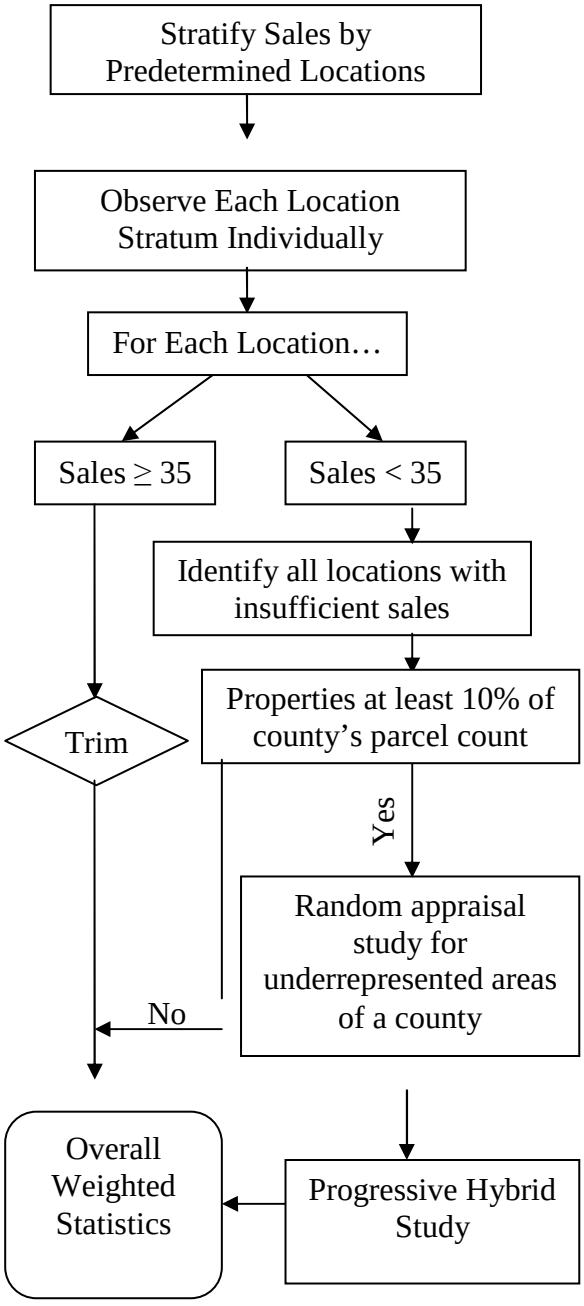
RESIDENTIAL TRADITIONAL SALES STUDY (Part 1)

- Sales information is collected from county assessors, along with the assessment roll, for an intensive study of the county.
- A minimum of 35 sales is necessary.
- The county must have a good history of sales disclosure and an aggressive approach to collecting sales.
- If the county's sales database is reliable, the STC will perform a random appraisal study.
- If the county's sales database is reliable, then the sales will be trimmed using the interquartile range method (3.0 coefficient) about the logarithmic ratios.
- If the median is within 90%-110%, no compliance order will be issued.
- If the median is outside of the 90%-110% window, then the COD (Coefficient of Dispersion) is observed. If the COD is less than 20% and the median 95% confidence interval intersects 90% or 110%, no compliance order will be issued.
- If the median is outside of the 90%-110% and the COD is greater than 20% or the confidence interval does not intersect 90% or 110%, then the sales are stratified by location.

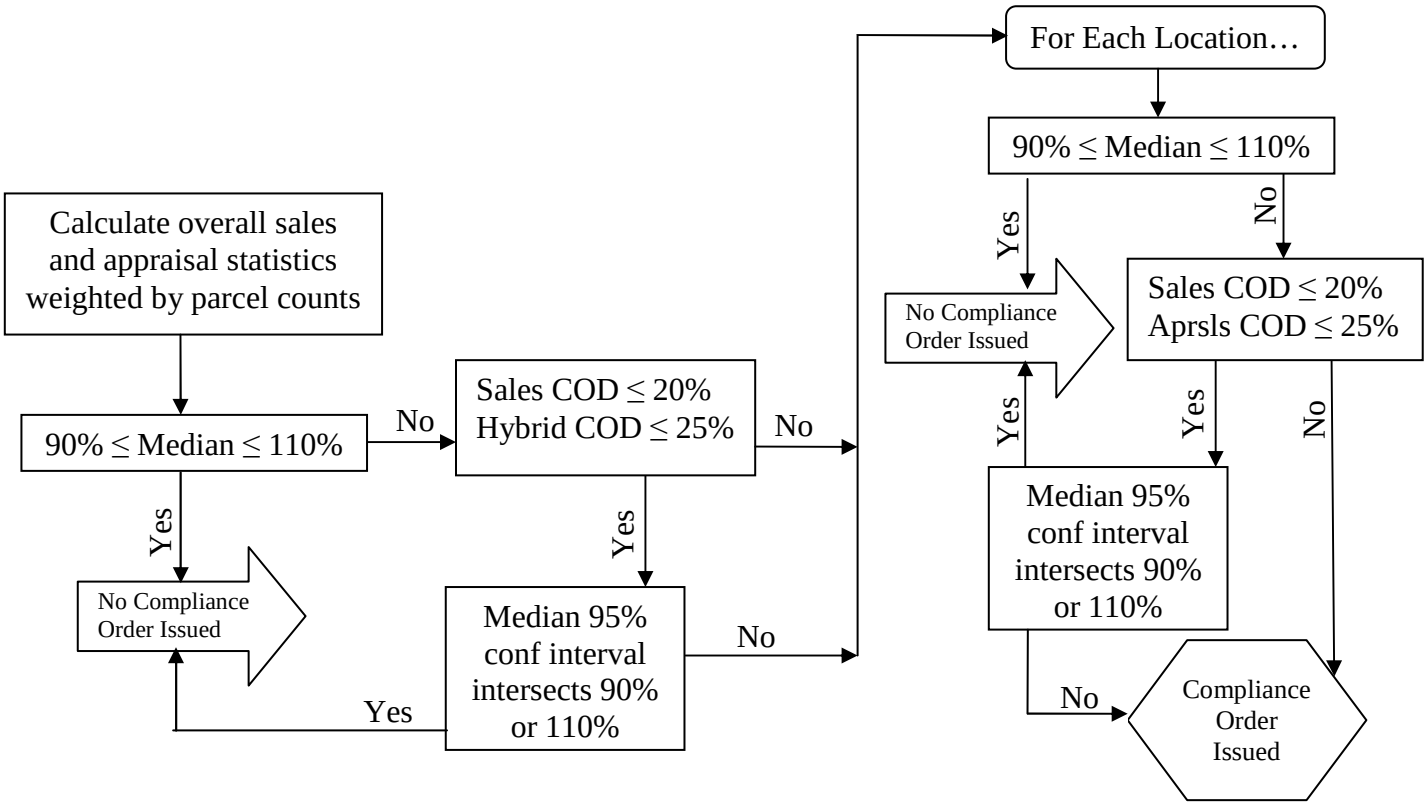


RESIDENTIAL TRADITIONAL SALES STUDY (Part 2)

- County assessors are given the opportunity of defining geographic locations when the databases are requested.
- Each location is identified and observed individually in the study.
- Each location has to meet the minimum sample size requirements.
- If there are at least 35 sales, then the sales ratios are trimmed and used to analyze properties in the area.
- If there are less than 35 sales, then all locations with fewer than 35 sales are identified. These areas are combined together.
- If the merged locations are at least 10% of the county's parcel count, then the sales will be rejected and there will be a random appraisal study in these locations.
- The Progressive Hybrid Study considers a sales study in the areas of the county that are represented by sales and appraisals in the areas of the county that have insufficient sales samples.
- The overall statistics for the ratio data is calculated and weighted by the proportions of the parcel counts.



RESIDENTIAL WEIGHTED SALES & PROGRESSIVE HYBRID STUDY



- Overall statistics are calculated by weighting the location studies by the parcel counts.

- If the median is within 90% to 110%, then there is no compliance order issued.

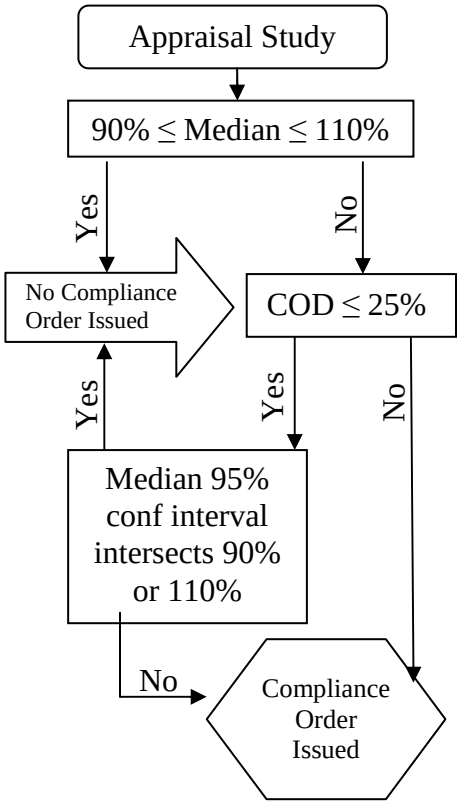
- If the median is outside of this range, then the coefficient of dispersion is observed.
  - If the COD is within tolerance, then the median confidence interval must intersect 90% or 110%.
  - If the COD is out of tolerance, then each individual location is observed.

- For each stratified location, the median is observed. If the median is within 90% to 110%, then there is no compliance order issued for the location.

- If the median is outside of this range, then the coefficient of dispersion is observed.
  - If the COD is within tolerance, then the median confidence interval must intersect 90% or 110%.
  - If the COD is out of tolerance, then each individual location is observed.

RESIDENTIAL APPRAISAL STUDY

- A random appraisal study is performed for approximately 35 randomly selected parcels in the county.
- If the median is within the 90% - 110% range, then no compliance order is issued.
- Otherwise, if the median is outside of the 90%-110% range, then the COD is observed.
- If the COD is less than 25%, then the median confidence interval must intersect either 90% or 110%.
- If the median is out of tolerance, then a compliance order is issued.



4.3.2 AGRICULTURAL & COMMERCIAL DECISION MODEL

The decision model for agriculture and commercial property follows similarly to the residential decision model for the appraisal study (shown above). The only exception is that the allowable COD increases from 25% for residential property to 30% for agricultural and commercial property.

For agricultural or commercial appraisal studies, if the median is outside of the 90%-110% range, then the coefficient of dispersion must be less than 30%. If the COD is less than 30%, then the median confidence interval must intersect 90% or 110%. Otherwise, a compliance order is issued.

4.4 STATISTICS

Statistics is the branch of applied mathematics that concerns itself with the collection of quantitative data, testing inferential hypotheses, and estimating population parameters using probability theory.

The statistics used by the Commission begins with a defined population. A **population** is the set of all entities the study finds of interest. All vacant and improved parcels residing in the residential subclass comprises the residential population for that county. A **simple random sample** is a representative subset of the population. A study is said to be **random** if each individual from the population has an equal chance of entering the set of sample selections. Samples are **independent** if the value or results of one individual does not affect another. The Commission randomly selects properties from the population of each subclass of real property in a given county to create a representative, independent, simple random sample.

Data, the collection of factual information, is drawn from the study of each individual from the sample. The Commission uses both qualitative and quantitative values to form inferences that justify hypotheses. An **inference** is the deductive and inductive logical reasoning involved in forming a conclusion or premise. A **statistic** is the arithmetic metric that is derived from an inference to describe a sample. Statistics are often considered to be estimates that describe the population's true distribution and attributes. Examples of statistics include the sample mean, and the sample variance, s2. A **parameter** is an estimate of the population metrics. Such examples of a parameter would be the population mean, μ, and the population variance, σ2. A **census** occurs when the entire population is included in the sample. It should also be known that statistics used to describe a sample are denoted with English letters whereas parameters are symbolized with the Greek alphabet.
Descriptive statistics summarize the distribution of the collected data. Knowing such information provides the ability to analyze and interpret characteristics that will be important for the study. The following is a list, although by no means exhaustive, of the important descriptive statistics that are imperative for analysts of all levels to be aware of: A list of the important descriptive statistics will be defined and discussed through examples.

4.4.1 MEASUREMENTS OF CENTRAL TENDENCY

The **mean**, also known as the arithmetic average, is created by adding together all individual samples and dividing by the number of samples. The sample mean $\bar{x}$ is computed as follows:

Let n represent the number of observations in the sample.
Let x_i represent the i^{th} observation of the sample.

$$\bar{x} = \frac{x_1 + x_2 + \ldots + x_{n-1} + x_n}{n} = \frac{\sum_{i=1}^{n} x_i}{n}$$

The mean ratio is a helpful statistic. Some advantages of using the mean ratio include the ease in understanding the concept, the value of every ratio is considered, and further statistical applications can be used that are based around the value of the mean.

Table 1

Sample	Assessed Value	Appraised Value	Ratio	Ratio/0.19
1	$5,780	$42,200	0.1370	72.1%
2	$100	$500	0.2000	105.3%
3	$5,720	$31,800	0.1799	94.7%
4	$3,230	$17,400	0.1856	97.7%
5	$11,540	$59,100	0.1953	102.8%
6	$1,330	$16,200	0.0821	43.2%
7	$4,580	$25,900	0.1768	93.1%
8	$3,290	$20,800	0.1582	83.3%
9	$3,840	$22,300	0.1722	90.6%
10	$5,350	$35,700	0.1499	78.9%
11	$160	$700	0.2286	120.3%

*Ratio/0.19 considers the residential assessment rate

For the mean ratio from the data provided in **Table 1**, one would add all of the ratio values together and divide by the number of samples. In this scenario,

$$\bar{x} = \frac{0.1370 + 0.2000 + ... + 0.1499 + 0.2286}{11} = \frac{1.8655}{11} = 0.1696 \Rightarrow {}^{0.1696}\!/_{0.19} = 89.26\%$$

The mean is a biased statistic. A statistic is biased when the expected value is not equal to the population's true value. The mean is biased because of the inherent properties of ratios. A ratio that is low can be overwhelmed by a ratio that is high. When a ratio of 50% (1:2) is averaged with a ratio of 200% (2:1), the result is 125% (5:4). The ratios signaling undervalued properties have a finite range of greater than 0 to less than 1, (0,1), and the ratios signaling overvalued properties have an infinite range of greater than 1 to infinity, (1,∞).

The **unbiased (geometric) mean** removes the bias that exists when averaging ratios by applying a logarithmic transformation to each of the individual ratios prior to averaging. A logarithm is a transcendental function that converts the scale and location of the ratio variable. The new location of the ideal ratio is transformed from 100% to 0. Property assessments that are below the market value proxy range from negative infinity to 0, (-∞,0), and property assessments that are above the market value proxy range from 0 to positive infinity, (0,∞).

After the logarithmic ratios have been calculated and averaged, they can be converted back to the

original spectrum of positive real numbers using the exponential (anti-log) function. The exponential function of the average of the logarithm of the ratios will produce an unbiased estimator that can be used to compute an unbiased mean. This unbiased estimator is referred to as the geometric mean in previous versions of the IAAO's Standard on Ratio Studies. The geometric mean is denoted as the nth root of the product of the ratios.

Table 2

Sample	Assessed Value	Appraised Value	Ratio	Ratio/0.19	ln|Ratio|
1	$5,780	$42,200	0.1370	72.1%	-0.3270
2	$100	$500	0.2000	105.3%	0.0513
3	$5,720	$31,800	0.1799	94.7%	-0.0546
4	$3,230	$17,400	0.1856	97.7%	-0.0234
5	$11,540	$59,100	0.1953	102.8%	0.0275
6	$1,330	$16,200	0.0821	43.2%	-0.8391
7	$4,580	$25,900	0.1768	93.1%	-0.0720
8	$3,290	$20,800	0.1582	83.3%	-0.1832
9	$3,840	$22,300	0.1722	90.6%	-0.0984
10	$5,350	$35,700	0.1499	78.9%	-0.2371
11	$160	$700	0.2286	120.3%	0.1849

Logarithmic (Unbiased) Mean: $e^{\frac{1}{n}\sum_{i=1}^{n}\ln|r_i|}$; where *n* is the sample size, *e* is the exponential function base 2.71, and *ln* refers to the natural logarithm.

From Table 2:

$$e^{\frac{1}{n}\sum_{i=1}^{n}\ln|r_i|} = e^{\frac{1}{11}\times(-0.3270+0.0513+\ldots+-.2371+0.1849)} = e^{\frac{1}{11}\times(-1.5710)} = e^{-0.1428} = 86.69\%$$

Geometric Mean: $\sqrt[n]{\prod_{i=1}^{n} r_i}$; where *n* is the sample size. All ratios are multiplied together and the nth root of the product is calculated.

Note that the two expressions are identical and that $e^{\frac{1}{n}\sum_{i=1}^{n}\ln|r_i|} = \sqrt[n]{\prod_{i=1}^{n} r_i}$.

Proof: $\ln\|r_1\|+\ln\|r_2\|+\ldots+\ln\|r_n\|$	=	$\ln\|r_1\times r_2\times\ldots\times r_n\|$	Property of Logarithms
$\frac{\ln\|r_1\|+\ln\|r_2\|+\ldots+\ln\|r_n\|}{n}$	=	$\frac{\ln\|r_1\times r_2\times\ldots\times r_n\|}{n}$	Divide by sample size *n*
$\frac{\ln\|r_1\|+\ln\|r_2\|+\ldots+\ln\|r_n\|}{n}$	=	$\ln\|r_1\times r_2\times\ldots\times r_n\|^{\frac{1}{n}}$	Property of logarithms

$$e^{\frac{\ln|r_1|+\ln|r_2|+\ldots+\ln|r_n|}{n}} = e^{\ln|r_1\times r_2\times\ldots\times r_n|^{\frac{1}{n}}}$$ Apply antilog to both sides

$$e^{\frac{\ln|r_1|+\ln|r_2|+\ldots+\ln|r_n|}{n}} = (r_1\times r_2\times\ldots\times r_n)^{\frac{1}{n}}$$ Simplify right side

$$e^{\frac{1}{n}\sum_{i=1}^{n}\ln|r_i|} = \sqrt[n]{\prod_{i=1}^{n} r_i}$$ Rewrite expressions ▪

The **median,** $\tilde{x}$, is the middle observation when the values of the data are arrayed (listed from smallest to largest; or listed from largest to smallest).

If the number of observations is odd, $\tilde{x} = \left(\frac{n+1}{2}\right)^{th}$ ordered value.

If the number of observations is even, $\tilde{x} = \frac{\left(\frac{n}{2}\right)^{th} + \left(\frac{n+1}{2}\right)^{th}}{2}$ ordered values.

That is, if the number of observations is odd, the middle observation of the ordered data is the median. When the number of observations is even, the average of the two middle-most ordered observations is the median.

Table 3

Sample	Assessed Value	Appraised Value	Ratio	Rank
6	$1,330	$16,200	0.0821	1
1	$5,780	$42,200	0.1370	2
10	$5,350	$35,700	0.1499	3
8	$3,290	$20,800	0.1582	4
9	$3,840	$22,300	0.1722	5
7	$4,580	$25,900	0.1768	6
3	$5,720	$31,800	0.1799	7
4	$3,230	$17,400	0.1856	8
5	$11,540	$59,100	0.1953	9
2	$100	$500	0.2000	10
11	$160	$700	0.2286	11

The median ratio is an ordered statistic that concerns itself only with the middlemost value(s). It is determined by listing the ratios in order and finding the one in the middle. **Table 3** shows the ratios listed in an ascending (increasing) order.

Since there are 11 samples, n=11.

$$\tilde{x} = \left(\frac{n+1}{2}\right)^{th} = \left(\frac{11+1}{2}\right)^{th} = \left(\frac{12}{2}\right)^{th} = 6^{th} = 0.1768 \Rightarrow {}^{0.1768}\!/_{0.19} = 93.05\%$$

The **mode** of a numerical data set is the value or values that occur most frequently. A sample can have more than one mode.

Unimodal – One mode
Bimodal – Two modes
Multimodal – Two or more modes

The **weighted mean** is another descriptive statistic that describes central tendency. Weighted means generally are used in physics to describe moments of inertia and the center of mass. However, the weighted mean can also be applied to population studies in statistics. The Commission uses the weighted mean in the ratio study. It is calculated by summing both the individual assessed values and the individual indicators of market value, sales prices or appraised values.

That is, for the weighted mean, $\ddot{o} = \frac{\sum Assessed}{\sum Appraised}$.

The weighted mean reflects the relationship of the total assessed value to the total market value of each subclass. From **Table 1**, the weighted ratio would be discovered using the following formula:

$$\hat{x} = \frac{\sum Assessed}{\sum Appraised} = \frac{\$44{,}920}{\$272{,}600} = 0.1648 \Rightarrow {}^{0.1648}\!/_{0.19} = 86.74\%$$

4.4.2 MEASUREMENTS OF VARIATION

The **Price Related Differential** (PRD) is found by dividing the mean by the weighted mean. This comparison tests for equity between low market value properties and high value properties. Disparate values suggest that inequities may exist. Therefore, the State Tax Commission has adopted the IAAO's Standard on Ratio Studies (v17.03) recommendation that price related differentials should lie between 0.98 and 1.03.

A PRD above 1.00 suggests that the assessment values placed on high-value parcels are relatively lower than the assessment values placed on low-value parcels. The ratios for higher-valued properties would tend to be below the ratios for lower-valued properties.

A PRD below 1.00 suggests that the assessment values placed on high value parcels are relatively higher than the assessment values placed on low-value parcels. The ratios for higher-

valued properties would tend to be above the ratios for lower-valued properties.

From the example above,

$$PRD = \frac{Mean}{WeightedMean} = \frac{89.26\%}{86.74\%} = 1.029$$

The **Coefficient of Dispersion** (COD) is a measurement of variability that assesses the horizontal uniformity of property. A lower Coefficient of Dispersion implies a less amount of variability. The COD measures the average percentage deviation of the ratios from the median ratio and is calculated from the following steps:

1. Subtracting the median from each ratio.
2. Taking the absolute value of the calculated differences.
3. Summing the absolute differences.
4. Dividing by the number of ratios to obtain the "average absolute deviation."
5. Dividing by the median.
6. Multiplying by 100.

From the data in **Table 1**, the coefficient of dispersion has been calculated:

Ratio	0.0821	0.1370	0.1499	0.1582	0.1722	0.1768	0.1799	0.1856	0.1953	0.2000	0.2286
Step 1	-0.0947	-0.0398	-0.0269	-0.0186	-0.0046	0.0000	0.0031	0.0088	0.0185	0.0232	0.0518
Step 2	0.0947	0.0398	0.0269	0.0186	0.0046	0.0000	0.0031	0.0088	0.0185	0.0232	0.0518
Step 3	0.2900										
Step 4	0.0264										
Step 5	0.1491										
Step 6	**14.9116 %**										

Quartiles, like medians, are ordered statistics based on the n^{th} observation. The median divides the data set into two distinct subsets: a lower subset and an upper subset. The lower subset consists of all data ranging from the minimum value to the median and the upper subset consists of all data ranging from the median to the maximum value. The **first quartile** is the median of the lower subset and the **third quartile** is the median of the upper subset. That is, when the data is ranked in ascending order, the data ranked at the 25^{th} percentile is the first quartile and the data ranked at the 75^{th} percentile is the third quartile. (The median can sometimes be considered as the second quartile.)

First Quartile	$\tilde{x}_1 = \left(\frac{n+1}{4}\right)^{th}$ ordered value.
Third Quartile	$\tilde{x}_3 = \left(\frac{3n+3}{4}\right)^{th}$ ordered value.

The **interquartile range** (IQR) is a metric that will help detect **outliers**. An outlier is an unusual observation that lies well below or well above what is expected. The interquartile range is calculated by subtracting the first quartile from the third quartile, taking the absolute value, and multiplying that by 1.5. Take this quantity and subtract it from the first quartile. That is the minimum value for the IQR. The maximum value for the IQR is obtained by adding the same metric to the third quartile.

$$\text{IQR} = \left(Q_1 - |Q_3 - Q_1| * 1.5 \ , \ Q_3 + |Q_3 - Q_1| * 1.5\right)$$

Extrema are outliers that are considered to be implausible and have a heavy influence on many descriptive statistics such as the mean. Extrema ranges are calculated using 3.0 instead of 1.5 from the formula listed above.

$$\text{EQR} = \left(Q_1 - |Q_3 - Q_1| * 3 \ , \ Q_3 + |Q_3 - Q_1| * 3\right)$$

Example

From the data in Table 2 in which the values are ranked, the first quartile would be the 3rd observation, 0.1499 and the third quartile would be the 9th observation, 0.1953. The interquartile range would be found as follows:

$$\text{IQR} = \left(0.1499 - |0.1953 - 0.1499| * 1.5 \ , \ 0.1953 + |0.1953 - 0.1499| * 1.5\right)$$
$$\text{IQR} = \left(0.1499 - |0.0454| * 1.5 \ , \ 0.1953 + |0.0454| * 1.5\right)$$
$$\text{IQR} = \left(0.1499 - 0.0454 * 1.5 \ , \ 0.1953 + 0.0454 * 1.5\right)$$
$$\text{IQR} = \left(0.1499 - 0.0454 * 1.5 \ , \ 0.1953 + 0.0454 * 1.5\right)$$
$$\text{IQR} = \left(0.1499 - 0.0681 \ , \ 0.1953 + 0.0681\right)$$
$$\text{IQR} = \left(0.0818 \ , \ 0.2634\right)$$

The State Tax Commission's trimming process uses the Interquartile Range method (with a 3.0 coefficient) applied to the logarithmic ratios.

1. Calculate the ratios for each individual in the sample.
2. Transform the ratios using the natural logarithm.
3. Compute trimming parameters using the logarithmic ratios.
    a. First quartile Q_1; (25^{th} Percentile)
    b. Third quartile Q_3; (75^{th} Percentile)
    c. Interquartile Range; $|Q_3 - Q_1|$
4. Ratios below the lower limit, $Q_1 - |Q_3 - Q_1| * 3$, are removed.
5. Ratios above the upper limit, $Q_3 + |Q_3 - Q_1| * 3$, are removed.

The **standard deviation** measures a sample's level of variability and spread. Calculating the standard deviation of a distribution without the aid of a computer spreadsheet application can easily become a difficult task.

Step	The standard deviation of a sample is	$s = \sqrt{\frac{\sum_{i=1}^{n}(x_i - \bar{x})^2}{n-1}}$
1	First, subtract the mean from each individual, x_i	$x_i - \bar{x}$
2	Square each of these differences.	$(x_i - \bar{x})^2$
3	Add each of these differences together.	$\sum_{i=1}^{n}(x_i - \bar{x})^2$
4	Divide the sum of the squared differences by the number of observations minus 1.	$\frac{\sum_{i=1}^{n}(x_i - \bar{x})^2}{n-1}$
5	Take the square root of this value.	$s = \sqrt{\frac{\sum_{i=1}^{n}(x_i - \bar{x})^2}{n-1}}$

Using the data from Table 1, the Standard Deviation about the Mean would be calculated as follows:

Ratio	0.0821	0.1370	0.1499	0.1582	0.1722	0.1768	0.1799	0.1856	0.1953	0.2000	0.2286
Step 1	-0.0875	-0.0326	-0.0197	-0.0114	0.0026	0.0072	0.0103	0.0160	0.0257	0.0304	0.0590
Step 2	0.0077	0.0011	0.0004	0.0001	0.0000	0.0001	0.0001	0.0003	0.0007	0.0009	0.0035
Step 3	0.0147										
Step 4	0.0015										
Step 5	0.0384										

To calculate a **sample's variance**, another measurement of variability in a sample, use the same procedure as outlined above, but stop after step 4. That is, do not find the square root.

The **standard error in a mean ratio** measures the extent to which each individual ratio in a sample differs from that of the predicted value. The standard error of the mean ratio can be estimated using a predicted value of the population's standard deviation through the standard deviation of the sample. Standard Error of Mean Ratio $= \frac{s}{\sqrt{n}}$.

Example:
Recall s=0.0384, as observed in the standard deviation calculation.
Recall n=11, which is the sample size.

The standard error of the mean ratio is $= \frac{s}{\sqrt{n}} = \frac{0.0384}{\sqrt{11}} = 0.01158$

A **confidence interval** is a range in which the true estimator of the population is expected to lie based on a predetermined percent of accuracy. For example, a 95% confidence interval gives a range of values. These values predict that the true mean of the population from which the sample was taken lies within the interval. As the confidence level decreases from 95%, the range becomes smaller. Similarly, if the confidence level increases from 95%, the range becomes larger.

The **median confidence interval,** unlike the confidence interval about the mean, is not based on the assumption of a normal distribution. It is found by ranking the data: sorting the data in order and assigning each data entry a number based on the value in relation to the others. If two or more data points are tied for the same rank, the rank assigned to these values is averaged.

After ranking the data, determine if the number of entries is even or odd. If the number is even, the number of observations one must count up and down from the median to find the control limits for the 95% confidence interval about the median is found by:

$$j = \frac{1.96 \times \sqrt{n}}{2}$$

If the number of observations is odd,

$$j = \frac{1.96 \times \sqrt{n}}{2} + 0.5$$

After determining the value of j, round the value up to the highest integer. From the values that are ranked, find the median, and count up and down j data entries to find the limits of the confidence interval.

4.5 DATA REQUEST

The State Tax Commission requires the information necessary to conduct the ratio studies be submitted in a computer database format. The objective for this requirement is to make the collection of data as efficient as possible. Standards for reporting information are designed such that the data is only requested once.

4.5.1 ASSESSMENT ROLL

An electronic version of the assessment roll is requested from each county. This database is necessary so that all ratio studies can be performed without additional data requests.

Requested Database Fields (2009 cycle example)

Field Name	Format	Contents
UPN	Text	Unique Identifier for a parcel or property. Account numbers are also accepted. The UPN can be masked with decimals and hyphens or just a string of numbers and letters.
RES09	Numeric	The Residential Assessment Value for the 2009 Tax Year
AGR09	Numeric	The Agriculture Assessment Value for the 2009 Tax Year
COM09	Numeric	The Commercial Assessment Value for the 2009 Tax Year
RES08	Numeric	The Residential Assessment Value for the 2008 Tax Year
AGR08	Numeric	The Agriculture Assessment Value for the 2008 Tax Year
COM08	Numeric	The Commercial Assessment Value for the 2008 Tax Year
SITUSADD	Text	Situs Address (If unavailable, do not include mailing address)
SITUSCITY	Text	Situs City (If unavailable, do not include mailing city)
SITUSSTATE	Text	Situs State (If unavailable, do not include mailing state)
SITUSZIP	Text	SitusZip (If unavailable, do not include mailing zip)
LEGAL	Text	Legal Description
LOT	Text	Lot
BLO	Text	Block
SUB	Text	Subdivision
SEC	Text	Section
TWN	Text	Township
RNG	Text	Range
LANDUSE	Text	Land Use such as improved, vacant, etc
SCHOOLDIST	Text	School District Code (Include a coding key file) If school district code is unavailable, include tax code with a coding key.
GEOGRAPHIC	Text	County's Preferred Geographic Stratification Variable. If the school district variable is not a preferred way to segment the county, then a different variable, such as zones or areas, should be included.
ACRES	Text	Acreage

The following fields are requested with either the assessment roll or the building database, if available.

LOTFRONT	Text	Lot Front Length
LOTDEPTH	Text	Lot Depth Length
ROOMS	Numeric	The number of above grade rooms
BED	Numeric	The number of above grade bedrooms
BATH	Numeric	The number of above grade bathrooms
BSMNTSIZE	Text	Indicate the size of the basement (Sq Ft, full, partial, none, ∅, etc, or other code)
BSMNTFIN	Text	Indicate the finish of basement (None, partial, finished, etc, or other code; include BR/Bath counts if available and not reported above)
GARAGETYPE	Text	Indicate the type of garage (carport, attached, detached, none, etc, or other code)
GARAGECNT	Text	The number of cars for the garage

(If the county cannot delineate bedrooms and bathrooms for above grade vs. below grade, then the total number of bedrooms and bathrooms should be provided)

Requested Database Formats
The Commission prefers assessment roll data in a Microsoft Excel file. If that option is not available, then the preferred method is through a pipe "|" delimited file. Text files with a comma delimiter are acceptable, but there are often problems importing the large databases this way. The Commission also requests any codes used in the school district or geographic stratification variable.

4.5.2 BUILDING DATABASE

A building database is requested separately from the assessment roll to avoid confusion on defining a year built or living area for a property that has more than one dominant structure. The State Tax Commission's procedure involves defining improvements that are primary structures. These improvements often include single-family, multi-family, mobile homes, etc. If more than one of these primary structures exists on a parcel, then the information for that one parcel is not included in the year built or living area analysis. So, a property that sells with two or more primary structures is used in the overall statistics and the geographic location stratification, but not in the year built or improved area stratification.

Requested Database Fields

Field Name	Format	Contents
UPN	Text	Unique Identifier for a parcel or property. Account numbers are also accepted. The UPN can be masked with decimals and hyphens or just a string of numbers and letters
STRUCTURE	Text	A code that can refer to the type of structure. (Single Family, Duplex, Garage, Utility, etc.)
STYLE	Text	Descriptive Property Features (1 Story, 2 Story, Split Level, etc)
YRBLT	Numeric	The year the structure was built
AREA	Numeric	The size of the property. Gross living area is preferred if available. Otherwise, include base area. Adjusted area is not desired.

For some counties, living area may not be an available field. In which case, reporting base area is preferred. Adjusted area is not desired.

The building information will be filtered to include only dominant structures. Parcels with one dominant structure will have their detail information paired to the assessment roll for analysis.

Requested Database Formats

The Commission prefers building data in a Microsoft Excel file. If that option is not available, then the preferred method is through a pipe "|" delimited file. Text files with a comma delimiter are acceptable, but there are often problems importing the large databases this way. The Commission also requests any codes used in the school district or geographic stratification variable.

4.5.3 SALES DATABASE

A sales database is requested from all counties. The sales database deadline for submission is February 1 of the even numbered year subsequent to the assessment year. The database should consist of sales between January 1 of the even numbered year preceding the assessment year and December 31 of the assessment year (odd numbered year). The minimum fields that should be included are parcel number, sale price, and sale date.

As an example, for the 2009 assessment year, the deadline for submission of the sales database is February 1, 2010. The database will consist of sales between January 1, 2008 and December 31, 2009.

Valid Sales

A simple definition of a valid sale is a transaction that reflects market value where a willing seller offers the property but is not obligated to sell it, and the property is bought by a person who is willing to purchase but is not forced to do so. *(See page 4-1 for a more detailed definition of market value).*

Invalid Sales

The IAAO Standard on Ratio Studies, Appendix A, discusses guidelines for validating sales. A copy of the Standard can be found from the IAAO's website [http://www.iaao.org/]. Additional information on sales validation is available through the Standard. A short list of the fundamental reasons for invalidating sales is directly below.

Sales Generally Invalid for Ratio Studies

- Sales involving government agencies and public utilities
- Sales involving charitable, religious, or educational institutions
- Sales involving financial institutions
- Sales between relatives or corporate affiliates
- Sales settling an estate
- Forced sales

Sales with Special Conditions

- Trades
- Partial interests
- Land contracts
- Incomplete or unbuilt common property
- Auctions

Requested Database Fields

Field Name	Format	Contents
UPN	Text	Unique Identifier for a parcel or property. Account numbers are also accepted. The UPN can be masked with decimals and hyphens or just a string of numbers and letters.
Sale Price	Numeric	Sale Price; the proxy for market value between a willing buyer and a willing seller.
Sale Date	Date (mm/dd/yyyy)	The date of the transaction. The format can include month and year if the exact date is unknown.
Validation	Text	Any validation coding or key that determines if a sale was valid or invalid.

Requested Database Formats

The Commission prefers sales data in a Microsoft Excel file. If that option is not available, then the preferred method is through a pipe "|" delimited file. Text files with a comma delimiter are acceptable, but there are often problems importing the large databases this way.

4.5.4 SENDING DATA ONLINE

To help counties save on costs, all requested material can be sent electronically through a File Transfer Protocol (FTP.) Links are available on the STC website at http://stc.mo.gov/ and secure accounts are available to county officials.

4.6 DATABASE PREPARATION

The State Tax Commission has established a universal file labeling system for all electronic information received from the counties. Each county has their own electronic folder located on a State server. Each part of the procedure is kept in a database file so any questions can be answered easily by reviewing the labeling of the files with the following procedure.

4.6.0 COUNTY INFORMATION

There is a null folder that contains only the information received from the county. It is broken into three segments:

- Databases – Any electronic information received from the counties.
  - Assessment Roll – An electronic source that lists every parcel in the county with their descriptive information, as requested in the description above.
  - Sales Databases – An electronic source that lists the information collected by the assessor concerning sold properties.
  - Building Databases – An electronic source that lists every improvement in the county.
- Correspondence – Information collected from the State Tax Commission
  - E-mails – Any relevant documentation submitted by e-mail
  - Sales Letter Samples – Sample sales letters faxed or scanned
  - Completed Surveys – Surveys that have been received
- Codes – Any codes or data dictionaries received from the counties
  - Database codes for Fields

4.6.1 ASSESSMENT ROLL

The assessment roll, as requested from the information above, is treated with universal naming codes. Additional steps may be added as needed since information and formats differ by county.

a) Assessment roll received from the county
b) Assessment roll formatted
    - The file type may need to be formatted to be legible by the statistical programs
    - The parcel numbers may need to be masked so that a link can be made between other files.
    - Fields are coded
c) Building database received from county
d) Building Database formatted
    - Primary structures building database
    - New construction indicators
e) Assessment roll matched with primary structure database and new construction indicator.
    - The database files are matched by the universal parcel number or account number.
    - An indicator function is used to determine if any of the properties appear more than once.
    - Duplicate information is removed. Each parcel has exactly one record in the data.

4.6.2 APPRAISAL SAMPLES

A random sample for each of the three subclasses is generated. Each property that has an assessment of the subclass tested has an equal chance of selection. Approximately 35 randomly selected properties will be appraised by an employee from the State Tax Commission.

The statistical package that randomly samples properties uses the Mersenne Twister technique. This program encrypts a pseudo-random list of numbers. This process passes the most intensive random sampling examination: the Diehard Test.

Three subsets of the assessment roll are generated: one for each subclass. A random number is assigned to each record. Each integer assigned is unique. The file is then sorted by the random number.

Once samples are taken, the folders are organized thusly:

- Residential
    - Residential Assessment Roll – A subset of the assessment roll, which includes any property with a residential assessment.
    - Appraisal Study Random Sample

- Agricultural
  - Agricultural Assessment Roll – A subset of the assessment roll, which includes any property with an agricultural assessment.
  - Appraisal Study Random Sample
- Commercial
  - Commercial Assessment Roll – A subset of the assessment roll, which includes any property with a commercial assessment.
  - Appraisal Study Random Sample

Tax exempt or properties that cannot be appraised are omitted by the appraiser, not during the random sampling procedure.

The following screenshots of fictitious data demonstrate how the random sampling works.

Exhibit 1: Data Received From County

	UPN	RES09	AGR09	COM09
1	01-1.0-00-000-000-001.00	79371	0	0
2	01-1.0-00-000-000-001.01	0	54548	0
3	01-1.0-00-000-000-001.02	78311	0	0
4	01-1.0-00-000-000-001.03	0	0	24687
5	01-1.0-00-000-000-001.04	0	0	48682
6	01-1.0-00-000-000-001.05	89686	0	0
7	01-1.0-00-000-000-001.06	70586	0	0
8	01-1.0-00-000-000-001.07	99487	55279	0
9	01-1.0-00-000-000-001.08	0	0	56719
10	01-1.0-00-000-000-001.09	0	0	35232
11	01-1.0-00-000-000-001.10	79867	0	0
12	01-1.0-00-000-000-001.11	27579	0	0
13	01-1.0-00-000-000-001.12	0	36844	60785
14	01-1.0-00-000-000-001.13	0	58220	0
15	01-1.0-00-000-000-001.14	0	0	94009
16	01-1.0-00-000-000-001.15	62254	0	0
17	01-1.0-00-000-000-001.16	0	28562	0
18	01-1.0-00-000-000-001.17	81659	0	0
19	01-1.0-00-000-000-001.18	0	0	74604
20	01-1.0-00-000-000-001.19	48218	0	0

Exhibit 2: Residential Assessment Roll

	UPN	RES09	AGR09	COM09
1	01-1.0-00-000-000-001.00	79371	0	0
2	01-1.0-00-000-000-001.02	78311	0	0
3	01-1.0-00-000-000-001.05	89686	0	0
4	01-1.0-00-000-000-001.06	70586	0	0
5	01-1.0-00-000-000-001.07	99487	55279	0
6	01-1.0-00-000-000-001.10	79867	0	0
7	01-1.0-00-000-000-001.11	27579	0	0
8	01-1.0-00-000-000-001.15	62254	0	0
9	01-1.0-00-000-000-001.17	81659	0	0
10	01-1.0-00-000-000-001.19	48218	0	0

Exhibit 3: Residential Assessment Roll (Assigned a random Sample Number)

	UPN	RES09	AGR09	COM09	SampleNumber
1	01-1.0-00-000-000-001.00	79371	0	0	3
2	01-1.0-00-000-000-001.02	78311	0	0	7
3	01-1.0-00-000-000-001.05	89686	0	0	4
4	01-1.0-00-000-000-001.06	70586	0	0	1
5	01-1.0-00-000-000-001.07	99487	55279	0	6
6	01-1.0-00-000-000-001.10	79867	0	0	10
7	01-1.0-00-000-000-001.11	27579	0	0	8
8	01-1.0-00-000-000-001.15	62254	0	0	9
9	01-1.0-00-000-000-001.17	81659	0	0	5
10	01-1.0-00-000-000-001.19	48218	0	0	2

Exhibit 4: Residential Appraisal Study Random Sample (Sorted by Sample Number)

	UPN	RES09	AGR09	COM09	SampleNumber
1	01-1.0-00-000-000-001.06	70586	0	0	1
2	01-1.0-00-000-000-001.19	48218	0	0	2
3	01-1.0-00-000-000-001.00	79371	0	0	3
4	01-1.0-00-000-000-001.05	89686	0	0	4
5	01-1.0-00-000-000-001.17	81659	0	0	5
6	01-1.0-00-000-000-001.07	99487	55279	0	6
7	01-1.0-00-000-000-001.02	78311	0	0	7
8	01-1.0-00-000-000-001.11	27579	0	0	8
9	01-1.0-00-000-000-001.15	62254	0	0	9
10	01-1.0-00-000-000-001.10	79867	0	0	10

4.6.3 SALES

The sales received from the county are prepared for the Traditional Sales Study.

a) Sales database received from county
b) Sales database formatted (File conversion, UPN Masking, fields coded, etc.)
    a. Sales assigned a row number from the original file
    b. Sales sorted by three ordered levels:
        i. UPN
        ii. Sale Date
        iii. Sale Price
c) County screened sales database (For counties submitting valid and invalid sales, the valid sales would be included and the invalid sales would be excluded).
d) Resales (properties that sell more than once) are identified.
e) Duplicate sales (repeated records) are removed properly.
f) If a property sells more than one time, then all sale prices must be within 5% of the minimum sale price. Otherwise, all sales from that property are removed.
g) A final sales file is generated that lists all sales that will be considered for the sales study.

4.6.4 MATCHING

The assessment roll with the structure information is matched to the sales database.

a) Assessment roll with the structure information is saved to this folder.
    a. UPN is formatted properly for sales, if it has not been done earlier.
    b. Records sorted by UPN.
    c. Duplicate properties are identified.
b) Sales database is matched to the assessment roll by UPN.
c) Columns are formatted so that scripts can recognize fields.

4.6.5 VALIDATION

Further validation is used after assessment roll matching is conducted.

a) New construction sales data is flagged for removal.
b) Sale dates are categorized for the different stages of the quality testing.

4.6.6 RELIABILITY RECOGNITION SAFEGUARD

A computer program template is used to compute the statistics in the Reliability Recognition Safeguard. Once the county is identified, historical information is inputted, including the county's sales disclosure history. A brief explanation is provided concerning both the quality of the sales validation/screening and the source of the databases. Data is imported from the sales

databases counties submit. The sales are inspected within a quality control review. Counties that fail to meet the State Tax Commission's review are subject to the random independent appraisal study. If county sales databases meet the State Tax Commission standards, then the sales are analyzed by the Traditional Sales Study.

4.6.7 TRADITIONAL SALES STUDY

Once a county passes the Reliability Recognition Safeguard, the sales are imported into program templates that can immediately calculate the statistics. The Traditional Sales Study has three stages: Preliminary, Tentative, and Final. First, the data is imported in the Preliminary stage. The statistics calculated are reviewed and the report quality is monitored. Once it is determined that the estimators are valid, reliable and reflect the county's level of assessment, the report becomes tentative and is subject to review by the county.

Internal Review:
Internal review consists of both specific computer program functions to review for potential errors, as well as oversight and review of results by Management. An initial review is also completed by the research analyst when preparing the data and compiling the reports.

External Review:
The tentative reports are forwarded to the county in both paper and digital format. Thirty days are permitted for the county to review the report. Data is available during every step of the study and can be converted to a variety of formats upon request. Counties are encouraged to review the information, ask any questions, and/or provide feedback. After the time period has lapsed, the study becomes final.

4.6.8 PROGRESSIVE HYBRID STUDY (as needed)

If the Tentative Traditional Sales Study suggests that the county's overall level of assessment is out of compliance and the sales do not adequately represent the population, as defined by the Compliance Order Decision Model, then the Progressive Hybrid Study is triggered. All properties that are in the area(s) not represented by the sales study that have a residential assessment are subject to random independent appraisals. Once the appraisals have been reviewed and confirmed, then the information is imported into the Progressive Hybrid Study. The overall weighted statistics become the reported statistics used in the study.

The internal and external review process for the sales portion of the Hybrid Study is the same as it is for the Traditional Sales Study (see 4.6.7 above). The internal and external review process for the appraisal portion of the Hybrid Study is the same as it is for the Random Appraisal Study (See 4-10; pp. 46-47). The sales study results are reported first when the county is notified that a Hybrid Study will be performed. The appraisal study results are supplied at a later date, when the appraisals are complete. The final analysis combining the sales and appraisals then has

already considered any comments, information and feedback from the review processes for both sales and appraisals.

4.7 RELIABILITY RECOGNITION SAFEGUARD

The Reliability Recognition Safeguard is a review of the quality of the sales databases that are submitted by the counties. The following is a list of some of the information that is observed:

- Total number of transfers
- Number of sales letters sent as a percent of transfers
- Sales returned percentage
- Number of usable sales from transfers
- Number of useable sales as a percent of transfers
- Turnover rate as a percentage of total parcels
- Turnover rate as a percentage of residential parcels
- Percent of properties unchanged in value for sold vs. unsold properties
- Overall statistics for specified time frames
    - July – Dec of Even Year
    - Jan – June of Odd Year
    - July – Dec of Odd Year
    - 1 Year study period vs. 6 months after
- Percent of change for sold properties v neighboring properties
- Percent change for sold properties v all unsold properties

4.8 TRADITIONAL SALES STUDY

1) If the Reliability Recognition Safeguard adheres to the IAAO Standards, then the sales are used as proxies for market value.
2) Overall Statistics are reported in a two page format featuring an executive summary, State Tax Commission procedures, and pre-trim and post-trim statistics with graphs and tables.
3) Sales are stratified between vacant and improved properties.
4) Sales are stratified by a location variable and overall weighted confidence intervals are calculated using formulas created by Dr. Wade Davis, PhD..
5) Sales are stratified by additional variables, when appropriate, with weighted confidence intervals that reflect population proportions.

- The cover page for the Traditional Sales Study immediately identifies the county, subclass, and reassessment cycle.
- The left side briefly explains the three types of residential studies
    - Traditional Sales Study
    - Progressive Hybrid Study
    - Random Appraisal Study
- The mission statement for the State Tax Commission is presented.
- An Executive Summary is provided. Often, the following information is provided:
    - Overall levels of assessment
    - Overall levels of uniformity
    - Conclusions from stratification
    - Any issues or areas of concern that was learned from completing the study.
- The assessment ratios are calculated and the post-trim ratios are reported.
    - Sample Size
    - Trim Counts
    - Median
    - Unbiased (Geometric) Mean
    - Mean
    - Weighted Mean
    - Coefficient of Dispersion
    - Price Related Differential
    - Coefficient of Concentration (Percent of sales ratios within 90%-110% of market value)
- Histogram of trimmed ratios

State Tax Commission of Missouri

Residential ◊ Sample ◊ 2007 - 2008 Reassessment

State Tax Commission of Missouri
301 West High Street
PO Box 146
Jefferson City, MO 65102-0146

Phone: (573) 751 2414
Fax: (573) 751-1341

The State Tax Commission is dedicated to providing ratio studies that yield legitimate measurements of assessment through justifiable market opinions and impartial statistical analysis. The quality assistance provided to the assessors and their staff, through ratio section processes and procedures, will support the pursuit of finding an equitable solution for every jurisdiction in the state.

Innovative Ratio Study Techniques

- ✓ Provides assessors the finest assistance in measuring assessment levels and uniformity
- ✓ Cost effective enhancement of resources
- ✓ Accurate measurements of assessment
- ✓ Adheres to the regulations of the IAAO's Standard on Ratio Studies
- ✓ Complies with the Mission and Vision Statements of the State Tax Commission

The State Tax Commission shall uphold the constitution and statutes of the State of Missouri; faithfully and impartially execute an assessment program; promptly and efficently respond to the questions, complaints, and needs of taxpayers and assessing officers; and endeavor to eradicate the injustices and inequities in property tax assessment.

Finding the Equitable Solution

Three ratio study procedures are available for analysis:

1) Traditional Sales Study

A sales study that analyzes assessment levels based on sales stratified by land use, location, and characteristics of property.

2) Progressive Hybrid

Since sales often do not emulate the characteristics or attributes of the entire jurisdiction, restraints and expectations have been placed to ensure the quality of the data set. Unreliable sales samples within slow market areas may be supplemented by the hybrid study to reflect the trends of the county.

3) Random Appraisals

For many jurisdictions, the availability of sales is scarce. In such scenarios, parcels will be randomly appraised. Every parcel will have an equal chance to be selected in the random appraisal study.

http://www.stc.mo.gov/

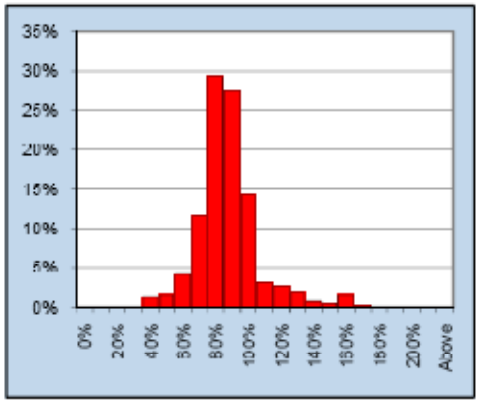
Executive Summary

The Traditional Sales Study shows that there is a median level of assessment of 90.5%. There is a good level of uniformity, as seen from the coefficient of dispersion and the price related differential.

2007 - 2008 Residential Appraisal Ratio

Traditional Sales Study
2007 - 2008 Residential Ratios

Sample Size	396	
Low / High Trims	13	15
Median	17.19	90.48%
Unbiased Mean	17.25	90.80%
Mean	17.59	92.59%
Weighted Mean	17.09	89.93%
Coefficient of Dispersion	14.30%	
Price Related Differential	102.96%	
Concentration *(90% - 110%)*	41.77%	



- The second page of the Traditional Sales Study continues with an explanation of how the trimming was performed for the overall statistics.
    - The trimming works by calculating the logarithm for each ratio from the sample.
    - The quartiles are calculated for the logarithmic ratios.
    - The interquartile range is calculated
    - The interquartile range method is applied, using a coefficient of 3.0
    - Any ratios outside of the appropriate range are flagged and removed
- Ratios before trimming are compared to ratios after trimming.
- Each of the fundamental statistics (with confidence intervals where appropriate) are presented :
    - Included is a description of what each of the statistics means.
    - There is a desirable tolerance for each of the statistics.
- The decision model only observes the following post-trim calculations:
    - Post-Trim Median
    - Post-Trim Median Confidence Interval
    - Post-Trim Coefficient of Dispersion
- Logic for the decision model:
    - Since the Traditional Sales Study was performed, then the sales passed the testing from the Reliability Recognition Safeguard.
    - If the overall post-trim calculated median lies between 90% and 110%, then the decision model is complete and no compliance order is issued.
    - If the overall post-trim calculated median lies outside of the 90% and 110% range, then the post-trim coefficient of dispersion (COD) is observed.
        - If the COD is below 20%, then the median confidence intervals are observed.
            - If the median confidence intervals overlap the 90%-110% range, then the decision model is complete and no compliance order is issued.
            - If the median confidence interval does not overlap the 90%-110% range, then the decision model calls for stratification by location.
        - If the COD is above 20%, then the decision model calls for stratification by location.

Sample

Summary Statistics

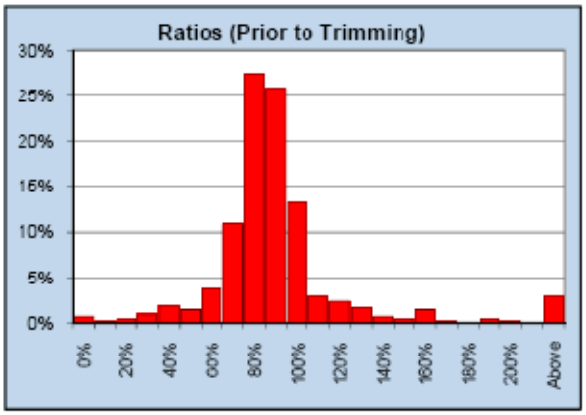
Page 2

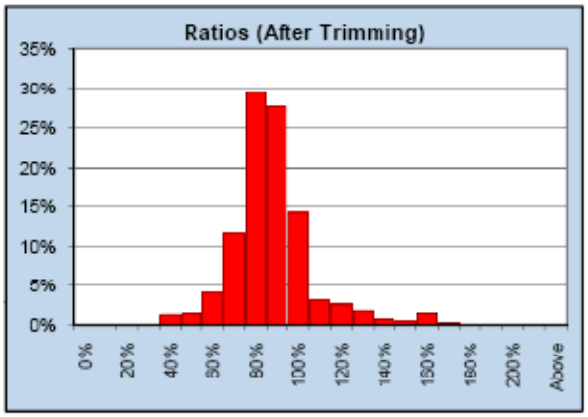
Flagging and Removing Influential Observations

A modern trimming procedure is used to generate a reliable data set for a sales study. Outliers will be detected for the overall statistics. The State Tax Commission has adopted the Interquartile Range method, which is a trimming technique that is recognized in the 2007 IAAO Standard on Ratio Studies v17.03. To promote a more reliable data set, a natural log transformation will be applied to the ratios. The natural log transformation removes the statistical bias from the ratios. Coupled with the Interquartile Range method, this technique tends to flag as many high outliers as low outliers. This trimming procedure tends to keep the median unchanged. In the event that the low trims are greatly different than the high trims, this indicates that the distribution of the ratios was skewed.

	Sample
Sample Size	423
High Trims	15
Low Trims	13
Total Trimmed	28
Remaining	395

The median is not sensitive to the statistical bias in ratios, but the mean is. The logarithmic transformation is applied to the ratios to remove statistical bias, trim outliers, and calculate the unbiased mean.





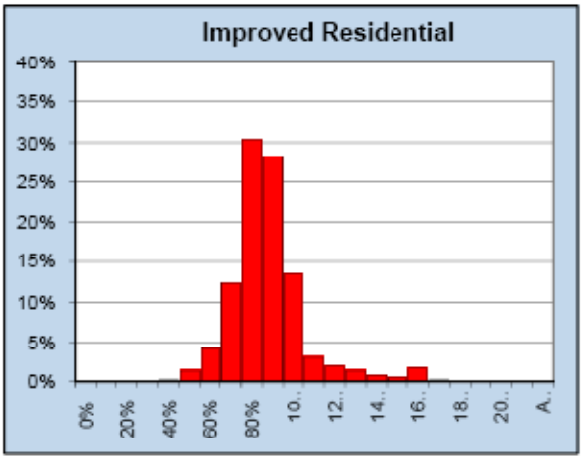
Overall Descriptive Statistics

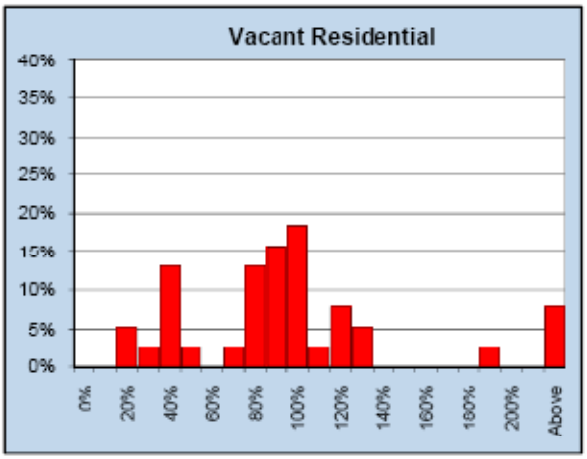
	Pre-Trim	Post-Trim
Sample Size	423	395
Median	90.5%	90.5%
Low 95% Conf Int	*89.2%*	*89.2%*
High 95% Conf Int	*92.5%*	*92.3%*
Unbiased Mean	91.1%	90.8%
Low 95% Conf Int	*87.4%*	*89.0%*
High 95% Conf Int	*95.0%*	*92.6%*
Mean	102.1%	92.6%
Low 95% Conf Int	*94.3%*	*90.7%*
High 95% Conf Int	*110.0%*	*94.5%*
Weighted Mean	90.3%	89.9%
Low 95% Conf Int	*87.9%*	*88.4%*
High 95% Conf Int	*92.7%*	*91.5%*
Coefficient of Dispersion	28.6%	14.3%
Low 95% Conf Int	*21.3%*	*12.9%*
High 95% Conf Int	*38.0%*	*15.9%*
Price Related Differential	113.2%	103.0%
Concentration *(90% - 110%)*	39.0%	41.8%

Description	Desirable
The number of sales	30 minimum
The ratio at the 50th percentile	90% - 110%
The range where the population's median most likely exists	Intersects within 90% and 110%
A very accurate average of ratios	90% - 110%
The range where the population's unbiased mean most likely exists	Intersects within 90% and 110%
The arithmetic average of ratios	90% - 110%
The range where the population's mean most likely exists	Intersects within 90% and 110%
Reflects the ratio of the total values	90% - 110%
The range where the population's weighted mean most likely exists	Intersects within 90% and 110%
Horizontal Uniformity: the variability among all county ratios.	Less than 20%
The range where the population's mean most likely exists	Low 95% Estimate less than 20%
Vertical Uniformity: measures differences between low and high priced properties	98% - 103%
The percent of ratios that lie within market value range (90% - 110%)	At least 33%

- The sales can be stratified by land use.
- This example illustrates the stratification between improved residential property and vacant residential property.
- Stratification by land use is not used in the Decision Model, but it is helpful to determine if conclusions can be drawn concerning where inequities exist within the county.

Sample — Improved & Vacant — Page 3





Flagging and Removing Influential Observations

A modern trimming procedure is used to generate a reliable data set for a sales study. Outliers will be detected for the overall statistics. The State Tax Commission has adopted the Interquartile Range method, which is a trimming technique that is recognized in the 2007 IAAO Standard on Ratio Studies v17.03. To promote a more reliable data set, a natural log transformation will be applied to the ratios. The natural log transformation removes the statistical bias from the ratios. Coupled with the Interquartile Range method, this technique tends to flag as many high outliers as low outliers. This trimming procedure tends to keep the median unchanged. In the event that the low trims are greatly different than the high trims, this indicates that the distribution of the ratios was skewed.

	Improved	Vacant
Sample Size	380	43
High Trims	7	4
Low Trims	8	1
Total Trimmed	15	5
Remaining	365	38

The median is not sensitive to the statistical bias in ratios, but the mean is. The logarithmic transformation is applied to the ratios to remove statistical bias, trim outliers, and calculate the unbiased mean.

Overall Descriptive Statistics

	Improved	Vacant
Sample Size	365	38
Median	90.2%	96.0%
Low 95% Conf Int	*89.1%*	*85.0%*
High 95% Conf Int	*91.9%*	*104.4%*
Unbiased Mean	91.0%	90.7%
Low 95% Conf Int	*89.3%*	*73.0%*
High 95% Conf Int	*92.7%*	*112.6%*
Mean	92.6%	114.5%
Low 95% Conf Int	*90.7%*	*81.4%*
High 95% Conf Int	*94.5%*	*147.7%*
Weighted Mean	90.0%	112.9%
Low 95% Conf Int	*88.4%*	*68.8%*
High 95% Conf Int	*91.5%*	*156.9%*
Coefficient of Dispersion	13.7%	52.0%
Low 95% Conf Int	*12.3%*	*31.6%*
High 95% Conf Int	*15.4%*	*96.7%*
Price Related Differential	102.9%	101.5%
Concentration *(90% - 110%)*	41.6%	34.2%

Description	Desirable
The number of sales	35 minimum
The ratio at the 50th percentile	90% - 110%
The range where the population's median most likely exists	Intersects within 90% and 110%
A very accurate average of ratios	90% - 110%
The range where the population's unbiased mean most likely exists	Intersects within 90% and 110%
The arithmetic average of ratios	90% - 110%
The range where the population's mean most likely exists	Intersects within 90% and 110%
Reflects the ratio of the total values	90% - 110%
The range where the population's weighted mean most likely exists	Intersects within 90% and 110%
Horizontal Uniformity: the variability among all county ratios.	Less than 20%
The range where the population's mean most likely exists	Low 95% Estimate less than 20%
Vertical Uniformity: measures differences between low and high priced properties	98% - 103%
The percent of ratios that lie within market value range (90% - 110%)	At least 33%

- The next section of the Traditional Sales Study features stratification by location.
- Prior to the analysis, counties have the option of presenting a way to partition the county with respect to geographic area. This stratification should be broad enough so that the sample size requirements can be met, but still small enough such that homogenous groups of property are grouped together. School District is the default variable.
- 35 untrimmed sales consist of a sufficient sample size.
- All of the sales (including those that were trimmed during the overall analysis) are redistributed into the geographic strata.
- Sales in each location are trimmed independently.
- Post-trim statistics are reported at the bottom of page 4 from the example.
- The overall weighted statistics are calculated based on the number of properties in each of the areas. These counts include mixed use. Properties that have residential and agricultural and/or commercial assessments are included in the weight counts, but the sales consist of properties with strictly residential assessments. This allows for the Hybrid Study appraisals to consider any taxable property with a residential assessment.
- The overall statistics are calculated based on the weights. These statistics are based on formulas that were provided by Dr. Wade Davis, PhD.
- If the overall descriptive statistics are out of compliance, then the decision model extends to the stratification by location.
    - If the overall weighted median is between 90%-110%, then the decision model is complete and no compliance order is issued.
    - If the overall weighted median is outside of the 90%-110% range, then the COD is observed.
        - If the COD is below 20%, then the 95% confidence interval about the overall weighted median is observed. This measurement must intersect the 90%-110% range. Otherwise, if 90% or more of the county is represented, each stratum is tested using the decision model based on the median, coefficient of dispersion, and median confidence interval. If any of these strata are out of tolerance, than an order is issued.
        - If the COD is above 20% for the overall weighted calculations and 90% or more of the county is represented, then each stratum is tested individually as described above. A compliance order is issued for each location that is out of tolerance.
- Page 5 and 6 of the sample county show graph analysis.
    - Page 5 features quality control charts showing the results, by strata, for the median, coefficient of dispersion, coefficient of concentration, price related differential, sample size, and proportional allocation of sales.
    - Page 6 features histograms of ratios by area.
- Additional stratification is done with a similar template for additional variables, such as year built and size, but they are not involved with the decision model.

Sample

Stratification by School District

Page 4

All sales, including those previously trimmed, will be stratified into groups. For each stratum, the outliers will be recalculated and removed when flagged. Descriptive statistics will be calculated and reported. A summary statistic based on the strata's population proportions will also be computed.

School District	1	2	3	4	5	6	7	8
Sample Size	5	1	66	30	0	112	180	6
High Trims	0	0	0	2	0	0	4	0
Low Trims	0	0	0	1	0	0	2	0
Remaining	5	1	66	27	0	112	174	6
Population	228	165	4,278	993	60	6,797	9,759	428
Proportion	1.0%	0.7%	18.8%	4.4%	0.3%	29.9%	43.0%	1.9%

School district stratification shows 92% of the 22,711 residential properties assigned a school district could be analyzed. (Proportions above include mixed use for Hybrid Study consideration.)

Procedure for Stratification

Stratifying sales is a recommended strategy from the IAAO Standard on Ratio Studies. This procedure permits more precise estimation of assessment levels. It can be very helpful in assisting assessors to create a more effective biennial reassessment strategy. The default location variable for each county will be school districts. Weighted statistics will be calculated using the proportions of the number of properties in the county amongst each strata. When the overall descriptive statistics are out of tolerance, the Progressive Hybrid Study will be administered. The strata with an insufficient sales sample will be combined. Sales will be rejected in favor of an appraisal study for this portion of the county.

County assessors are given the option of changing the default location variable or requesting additional stratification prior to statistical analysis. Preferred stratification can be submitted for approval to the State Tax Commission. The county should provide information indicating why their preferred variable would better represent the characteristics of properties and tendencies of the market. Delineation maps and county sales studies would be helpful resources that can be used to generate better groupings of property.

The overall statistics for Morgan County were in compliance. Stratificiation by school district was used to provide detailed analysis of property assessments. For Morgan County, 91.7% of residential property was represented by the sales when stratified by school district. After properly weighting the sales ratios to reflect the population's characteristics with respect to school district, the median level of assessment is 80.3%, which is outside of the State Tax Commission's preferred limits of 90%-110%.

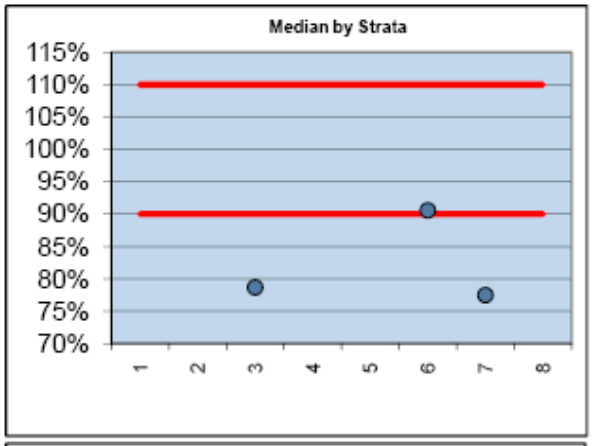
Post Trim Statistics	1	2	3	4	5	6	7	8	Overall Weighted
Sample Size	5	1	66	27	0	112	174	6	352
Median	N/A	N/A	78.7%	N/A	N/A	90.6%	77.5%	N/A	80.3%
Low 95% Conf Int	*N/A*	*N/A*	*74.8%*	*N/A*	*N/A*	*81.4%*	*73.3%*	*N/A*	*74.6%*
High 95% Conf Int	*N/A*	*N/A*	*86.4%*	*N/A*	*N/A*	*101.2%*	*81.7%*	*N/A*	*86.0%*
Unbiased Mean	N/A	N/A	81.4%	N/A	N/A	92.3%	75.9%	N/A	82.0%
Low 95% Conf Int	*N/A*	*N/A*	*75.6%*	*N/A*	*N/A*	*84.9%*	*71.9%*	*N/A*	*78.8%*
High 95% Conf Int	*N/A*	*N/A*	*87.5%*	*N/A*	*N/A*	*100.3%*	*80.1%*	*N/A*	*85.5%*
Mean	N/A	N/A	85.0%	N/A	N/A	101.3%	80.9%	N/A	88.4%
Low 95% Conf Int	*N/A*	*N/A*	*78.6%*	*N/A*	*N/A*	*93.1%*	*76.2%*	*N/A*	*84.6%*
High 95% Conf Int	*N/A*	*N/A*	*91.4%*	*N/A*	*N/A*	*109.4%*	*85.5%*	*N/A*	*92.1%*
Weighted Mean	N/A	N/A	82.3%	N/A	N/A	84.8%	77.6%	N/A	80.9%
Low 95% Conf Int	*N/A*	*N/A*	*77.5%*	*N/A*	*N/A*	*79.9%*	*74.3%*	*N/A*	*77.0%*
High 95% Conf Int	*N/A*	*N/A*	*87.0%*	*N/A*	*N/A*	*89.8%*	*80.9%*	*N/A*	*84.8%*
Coefficient of Dispersion	N/A	N/A	23.4%	N/A	N/A	36.9%	26.3%	N/A	30.0%
Low 95% Conf Int	*N/A*	*N/A*	*18.6%*	*N/A*	*N/A*	*31.8%*	*22.3%*	*N/A*	*27.0%*
High 95% Conf Int	*N/A*	*N/A*	*29.7%*	*N/A*	*N/A*	*42.5%*	*31.4%*	*N/A*	*33.3%*
Price Related Differential	N/A	N/A	103.3%	N/A	N/A	119.4%	104.2%	N/A	109.2%
Concentration *(90% - 110%)*	N/A	N/A	21.2%	N/A	N/A	17.0%	20.7%	N/A	19.6%

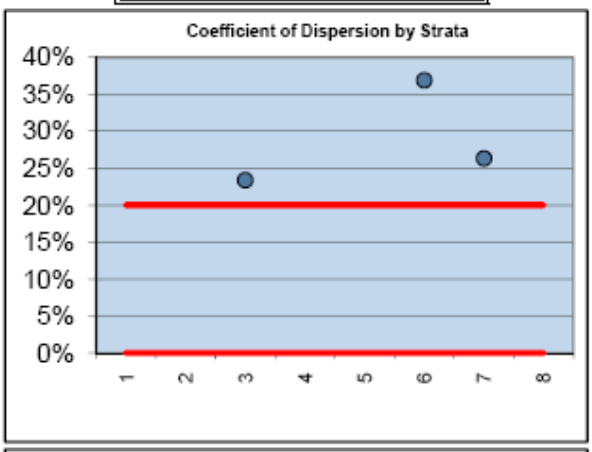
Sample

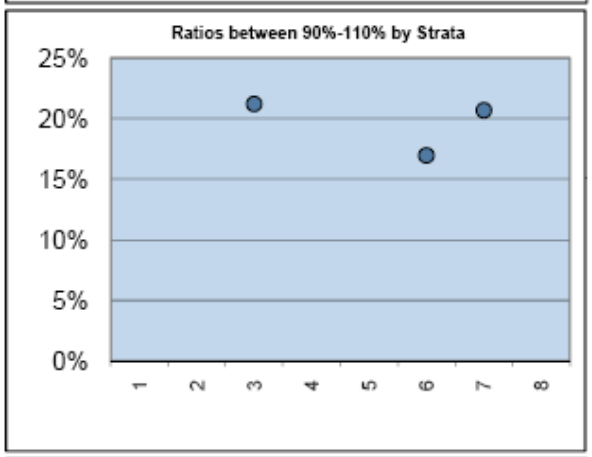
Stratification by School District

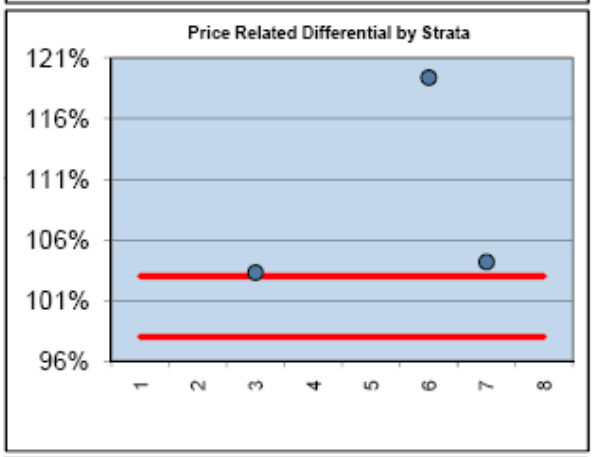
Page 5

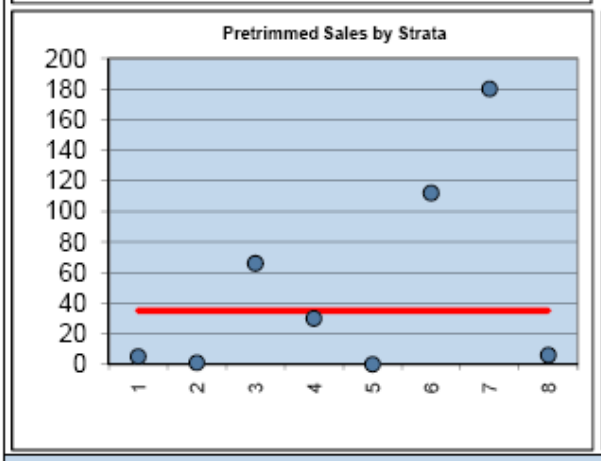
Descriptive Statistics



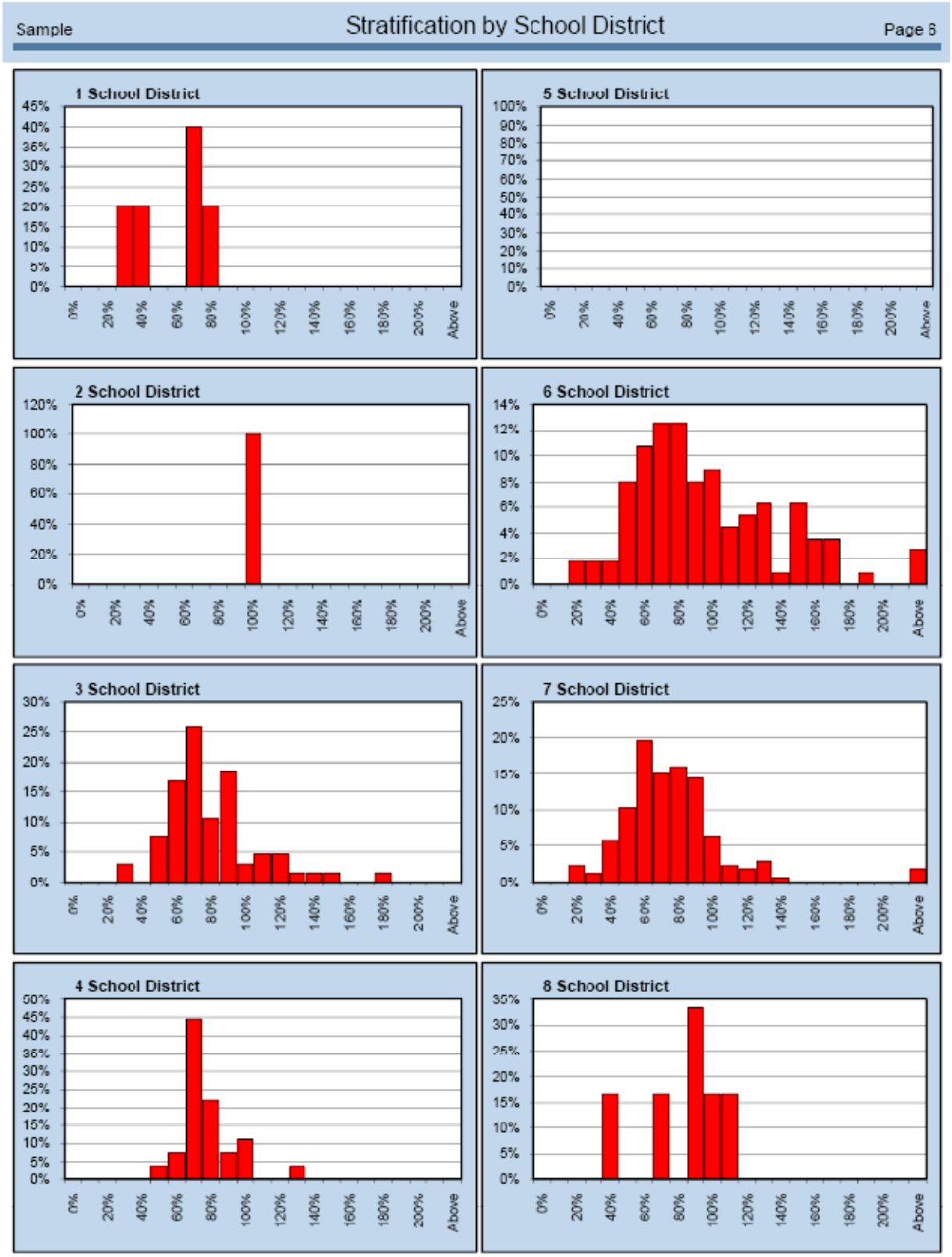








1 = 1 School District
2 = 2 School District
3 = 3 School District
4 = 4 School District
5 = 5 School District
6 = 6 School District
7 = 7 School District
8 = 8 School District


Sample
Stratification by School District
Page 6
1 School District
5 School District
2 School District
6 School District
3 School District
7 School District
4 School District
8 School District
0%
20%
40%
60%
80%
100%
120%
140%
160%
180%
200%
Above

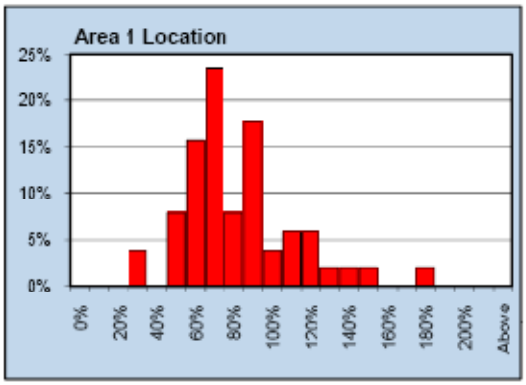
4.9 PROGRESSIVE HYBRID STUDY

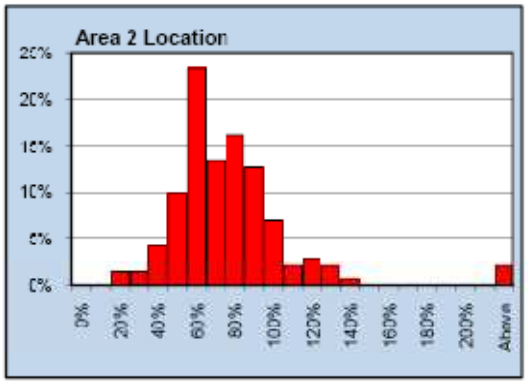
- The Progressive Hybrid Study is an analysis that combines sales and appraisals to determine the level of assessment.
- To qualify for the Progressive Hybrid Study, the Traditional Sales Study must show three inadequacies:
    - The overall statistics are out of compliance.
    - The overall weighted statistics are out of compliance.
    - The sales insufficiently represent the population with respect to the predefined locations.
- The Progressive Hybrid Study rejects sales for appraisals.
    - Sales that were within the areas with insufficient sample sizes are rejected.
    - All areas with sales that were insufficient in sample size are combined.
    - Approximately 35 random appraisals are taken from the combined areas.
- Overall weighted statistics are recalculated for the location variable once the appraisal data has been considered.
    - If the overall weighted median is within 90%-110%, then the decision model is complete and no compliance order is issued.
    - If the overall weighted median is outside of the 90%-110% range, then the overall weighted COD is observed.
        - If the COD is less than 25% and the overall weighted median confidence intervals intersect the 90%-110% range, then the decision model is complete and no compliance order is issued.
        - If the COD is more than 25% or the overall weighted median confidence intervals do not intersect the 90%-110% range, then the decision model is applied for each stratum independently. Sales strata must show a trimmed COD of under 20% and appraisal strata must show an untrimmed COD under 25%.

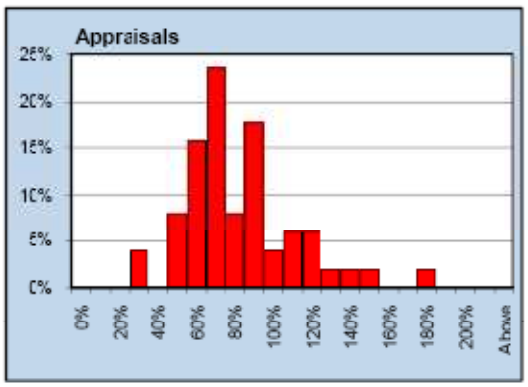
Sample (Tentative) **Hybrid (Location)** Page 7

Location	Area 1	Area 2	Aprsls
Sample Size	51	147	35
High Trims	0	4	0
Low Trims	0	2	0
Remaining	51	141	35
Population	7,500	7,500	5,000
Proportion	37.5%	37.5%	25.0%

Location stratification shows 100% of the 20,000 residential properties assigned a location could be analyzed. (Proportions above include mixed use for Hybrid Study consideration.)







Procedure for Stratification

Stratifying sales is a recommended strategy from the IAAO Standard on Ratio Studies. This procedure permits more precise estimation of assessment levels. It can be very helpful in assisting assessors to create a more effective biennial reassessment strategy. Weighted statistics will be calculated using the proportions of the number of properties in the county amongst each strata. When the overall descriptive statistics are out of tolerance, the Progressive Hybrid Study will be administered. The strata with an insufficient sales sample will be combined. Sales will be rejected in favor of an appraisal study for this portion of the county.

County assessors are given the option of changing the default location variable or requesting additional stratification prior to statistical analysis. Preferred stratification can be submitted for approval to the State Tax Commission. The county should provide information indicating why their preferred variable would better represent the characteristics of properties and tendencies of the market. Delineation maps and county sales studies would be helpful resources that can be used to generate better groupings of property.

The overall statistics for Sample County are in compliance. Stratification by location is used to provide detailed analysis of property assessments. For Sample County, 100.0% of residential property is represented by the sales when stratified by location. After properly weighting the sales ratios to reflect the population's characteristics with respect to location, the median level of assessment is 76.9%, which is outside of the State Tax Commission's preferred limits of 90%-110%. The

Post Trim Statistics	Area 1	Area 2	SIC Aprsls	Overall Weighted
Sample Size	51	141	35	227
Median	79.5%	77.6%	70.9%	76.9%
Low 95% Conf Int	*74.4%*	*71.2%*	*65.6%*	*69.3%*
High 95% Conf Int	*92.4%*	*81.0%*	*83.2%*	*84.5%*
Unbiased Mean	82.4%	77.0%	75.1%	78.5%
Low 95% Conf Int	*75.1%*	*72.7%*	*64.3%*	*74.8%*
High 95% Conf Int	*90.4%*	*81.6%*	*87.8%*	*82.4%*
Mean	86.9%	81.9%	83.7%	84.2%
Low 95% Conf Int	*78.7%*	*76.5%*	*67.8%*	*79.6%*
High 95% Conf Int	*95.0%*	*87.2%*	*99.5%*	*88.8%*
Weighted Mean	84.1%	76.7%	75.8%	79.3%
Low 95% Conf Int	*77.9%*	*72.9%*	*66.4%*	*73.6%*
High 95% Conf Int	*90.4%*	*80.4%*	*85.2%*	*84.9%*
Coefficient of Dispersion	26.8%	26.3%	36.7%	29.4%
Low 95% Conf Int	*19.8%*	*21.9%*	*22.3%*	*24.5%*
High 95% Conf Int	*34.5%*	*32.8%*	*60.3%*	*35.1%*
Price Related Differential	103.2%	106.8%	110.4%	106.2%
Concentration *(90% - 110%)*	21.6%	19.9%	14.3%	19.1%

4.10 RANDOM APPRAISAL STUDY

As of January 1, 2007 there were approximately 3.2 million parcels of real estate within the State of Missouri. As it is not feasible to test the relationships that exist between the assessed value and appraised value for every taxable parcel in the population, a random sampling process is used to select a representative number of parcels on which to make statistical inferences about the total population. The basic criterion of a random sampling is that each parcel within a given subclass has an equal opportunity of selection as a sample.

Agricultural and commercial properties are only analyzed by appraisal studies whereas residential property can be analyzed by either sales or appraisals. Sales studies for the agricultural and commercial subclasses are less likely to result in justifiable assessment level estimates.

Agricultural studies rely mainly on production value, rather than market value. Market value sales do not reflect production values based on the grading required by the State Tax Commission. No comparison can be made between production values determined by the assessor and market values from sales. Due to the different definitions of value being measured (production value vs. market value), no valid, reasonable, or reliable conclusions can be drawn from a sales ratio study on agricultural property. Assessors often do use market value sales for analyses on those agricultural properties where market value determinations are required, but this is such a small minority of the agricultural parcels that it still renders an overall sales ratio study to be inadequate for this classification of property.

The inherent disadvantages that can exist in sales are more common in commercial property. The number of sales and/or turnover rate is often inadequate to meet the standards of the State Tax Commission. For commercial property sales, there is immense difficulty separating out intangible value, personal property, and other valuable assets or considerations to obtain an adjusted sale value that appropriately represents the real property value. Additionally, it is much more difficult, subjective and burdensome to accurately validate sales for these properties. Therefore, a random independent appraisal study is utilized to produce valid statistical results that can accurately determine the level of assessment for commercial properties.

The random sample is performed from a computer program at the State Tax Commission. Every property that has an assessment from the tested subclass has an equal chance of selection. One of the greatest advantages for random samples is that as sample size increases, the selected properties have a higher likelihood of adequately representing the population. Coupled with the State Tax Commission's sample size requirements, the random appraisal test determines the level of assessment accurately.

Valuation

In the valuation phase, it is the responsibility of the appraiser to research the marketplace and to

seek the market information necessary to arrive at the market value of the properties selected. This does not apply, however, in the valuation of agricultural and horticultural land when such lands are valued by their productive capability. The effective date of all appraisals completed during the two-year period is January 1 of the first year, or odd-numbered year, of the valuation cycle. This conforms to the same effective date of appraisal that is used by the assessor in establishing the assessed values on the parcels selected. The Commission has adopted the Uniform Standards of Professional Appraisal Practice (USPAP) as the base standard to which appraisals performed for the State Tax Commission must comply.

Residential / Agricultural Property

Market value is the basis of value for properties in the residential and commercial subclasses. In the agricultural subclass, buildings and other structures customarily associated with farming and agricultural lands that are vacant and unused, in accordance with Section 137.017(4), RSMo, are valued under the market value concept. Lands that are used for agricultural and horticultural purposes are valued in accordance with the land's productive capability and graded using one of the eight (8) grades published by the Commission.

One of the benefits of implementing the two-year program is the improvements made in the valuation process. One of the improvements involves researching and inspecting market information. Appraisers now have the time to look for additional sales information and to inspect the properties that have sold to verify their comparability to the subject properties. The second improvement involves documenting the methodology employed by the appraiser in arriving at the appraised value of the properties in the study. It is important in reviewing an appraisal that the reader, or reviewer, is able to arrive at the same value conclusion as the appraiser who prepared the report. The reports have been produced and viewed digitally since 2005. Any data, information and documentation necessary to support the appraiser's opinions and conclusions are available in the work file. The appraiser's work file is retained for a minimum of five (5) years after preparation or for two (2) years after the final disposition of any judicial proceeding in which the appraiser provided testimony related to the assignment, whichever period expires last.

In the two-year cycle, the appraisal workload is balanced by completing approximately 40% of the residential appraisals in the odd-numbered year and the remaining 60% in the subsequent even-numbered year. In selecting counties for the first year, priority is given to those counties where preliminary research indicates potential valuation and/or other issues may exist that substantially impact the tax base.

Commercial Property

Market value is the basis of value for properties in the commercial subclasses. As with the residential and agricultural appraisals, expanding the time frame for completing the commercial appraisals improves the final product. Benefits are gained in the improved appraisal reporting

format and the additional time to investigate the marketplace for comparable sales and rentals that are essential to the valuation process.

The commercial studies are currently allocated over the two-year period with approximately 40% of the counties completed in the first year. In selecting counties for the first year, priority is given to those counties where preliminary research indicates potential valuation and/or other issues may exist that substantially impact the tax base.

Internal Review

The internal review process consists of two components. The first component involves an audit of the processes and procedures used in the appraisal process and the second component is a review of the valuation process.

The review is completed by the appraiser supervisor who checks for compliance with internal policies and procedures as well as USPAP compliance for accepted appraisal practices. They use the market information supplied by the appraiser plus any supplemental available market data that might be obtained in the review process. Desk audits and reviews are completed by Management staff on an 'as needed' basis to assist in maintaining quality control and adherence to policies and procedures.

External Review - County Meeting

The external review phase is that part of the process that allows the assessor to have input into the study and may include a meeting at their request.

The purpose of the external review is to secure any additional information that may assist the Commission in completing a fair and impartial study. The type of information typically obtained includes additional sales information, local factors that may have an impact on value, identification of incorrect parcels, land classification information, etc.

Upon completion of the internal review, the Tentative Ratio Study is completed. The individual samples, their assessment, and staff appraised values are detailed in a Ratio Report and corresponding Statistical Report. These two reports along with a digital copy of each individual appraisal are provided to the county assessor for review.

A member of the Ratio Section staff contacts the assessor to ask if a meeting to discuss the appraisals is wanted. At the meeting the appraiser receives input along with supporting documentation from the assessor on those properties on which the assessor wishes to comment. The comments are recorded on the County Meeting Review Form as shown in **Exhibit 4.9**. The purpose of the meeting is to obtain additional information, discuss the statistics that appear on the Statistical Report and to record any comments and concerns.

After each meeting, the appraiser and review appraiser conduct site inspections of any properties on which new sales information is provided. They also site inspect any property that requires a second review based upon information provided at the meeting.

After the meeting and any additional field reviews are completed, the appraiser and appraiser supervisor meet to review the appraisals in light of the comments and information obtained at the meeting. When an adjustment or change is warranted, they will then document their recommendation on the County Meeting Review Form. The appraiser will make the necessary changes in accordance with their agreed recommendations.

The final step in this part of the external review process is the generation of a revised ratio, referred to as the **Final Ratio,** and the redistribution of the new ratio to the county assessor.

An illustrative sample of a residential appraisal report is shown in **Exhibit 4-8** on the following pages. The appraisals may contain more information than is shown (zoning documents, maps, community information, etc).

EXHIBIT 4-8

SAMPLE RESIDENTIAL APPRAISAL REPORT

MISSOURI STATE TAX COMMISSION RESIDENTIAL PROPERTY APPRAISAL

Owner's Name:	John Doe	Insp. Date: 4/17/2008 Time: 9:45am Effective Date: 1/1/2007	
Situs Address:	12345 Smith Street	Date of Report: 8/19/2008 Book: Control No.: 2959	County/Sample Number: 27 / 123
City:	BOONVILLE	Property Use(s): R x A o C o	Use Code: 001
Parcel Number:	10-1.0-01-002-000-999.000	Sec. 1	
Legal Description:	LOT 2, SIMPSON HILLS ADDN. C, 75' X 120'	Twp. 48 Rng. 17 Acres:	Assessed Value: 10,600 Appraised Value: 70,000

NEIGHBORHOOD	IMPROVEMENTS	TOPOGRAPHY	SITE UTILITIES	
			PUBLIC	PRIVATE
☑ City Residential	☑ Paved Streets	☑ Level	☑ Electricity	☐ Septic
☐ Rural Residential	☐ Gravel Streets/Roads	☐ Rolling	☑ Natural Gas	☐ Lagoon
☐ Farm/Vac. Ag	☐ Sidewalks	☐ Steep	☑ Public Water	☐ Well
☐ Multifamily	☐ Rail Siding	☐ Low	☑ Sanitary Sewers	☐ Private Water
☐ Commercial	☐ Curbs & Gutters	☐ Flood Plain	☐ Storm Sewers	☐ Other
☐ Industrial	☐ Off Street Parking			
	☐ Other:			

APPRAISED VALUE

Value Conclusions		Final Value	
Cost:	$71,100	$11,300	L
Sales:	$70,000	$58,700	I
Income:		$70,000	T

PROPERTY SALES DATA

Sales Date: Sales Price $: Asking Price $:
Mortgage Amt. Mortgage Type:
Loan Term: Interest Rate:
Sale: ☐ Verified ☐ Non-verified

Marketability Of The Subject Property: ☑ Average ☐ Good ☐ Limited

Owner Contacted for Sale History: ☐ Yes ☑ No

Current Marketing Time: ☐ 1-3 Months ☑ 4-7 Months ☐ 8-12 Months ☐ More Than 1 Year

PROPERTY HIGHEST & BEST USE

☑ Present ☐ Other Zoning:
Zoning Compliance: ☑ Legal ☐ Legal Non-conforming ☐ Illegal ☐ None

INCOME INFORMATION

Monthly Rent Amount $:
Gross Rent Amount $:
Sales Price
GRM

Occupant: ☐ Owner ☐ Tenant

Rental Type: ☐ Market ☐ Monthly ☐ Contract ☐ Annual

APPRAISAL REVIEW

Appraiser No. 25
Inspected by: CW
Reviewed by: DK

USE RESTRICTIONS

This is a RESTRICTED USE appraisal intended for the use of the State Tax Commission only.

SALES HISTORY

The subject property last sold in 2002, but no sales price information was available at the time of this report.

FINAL VALUE RECONCILIATION

The sales comparison approach was considered the best approach for determining final value as there were several comparable sales available. There is insufficient income and expense data in the market for similar type properties; therefore, the Income Approach was not applicable. The cost approach was calculated and assists in validating the sales comparison approach.

SUBJECT PHOTOGRAPH SHEET

COUNTY-SAMPLE NUMBER: 27 / 123
PHOTO PAGE NUMBER: 1

Typical Street Scene: West View

Typical Street Scene: East View

Front View of Subject: Photo #1

Rear View of Subject: Photo #3

SUBJECT PHOTOGRAPH SHEET

COUNTY-SAMPLE NUMBER: 27 / 123
PHOTO PAGE NUMBER: 2

DESCRIPTION: Front View - Photo #2

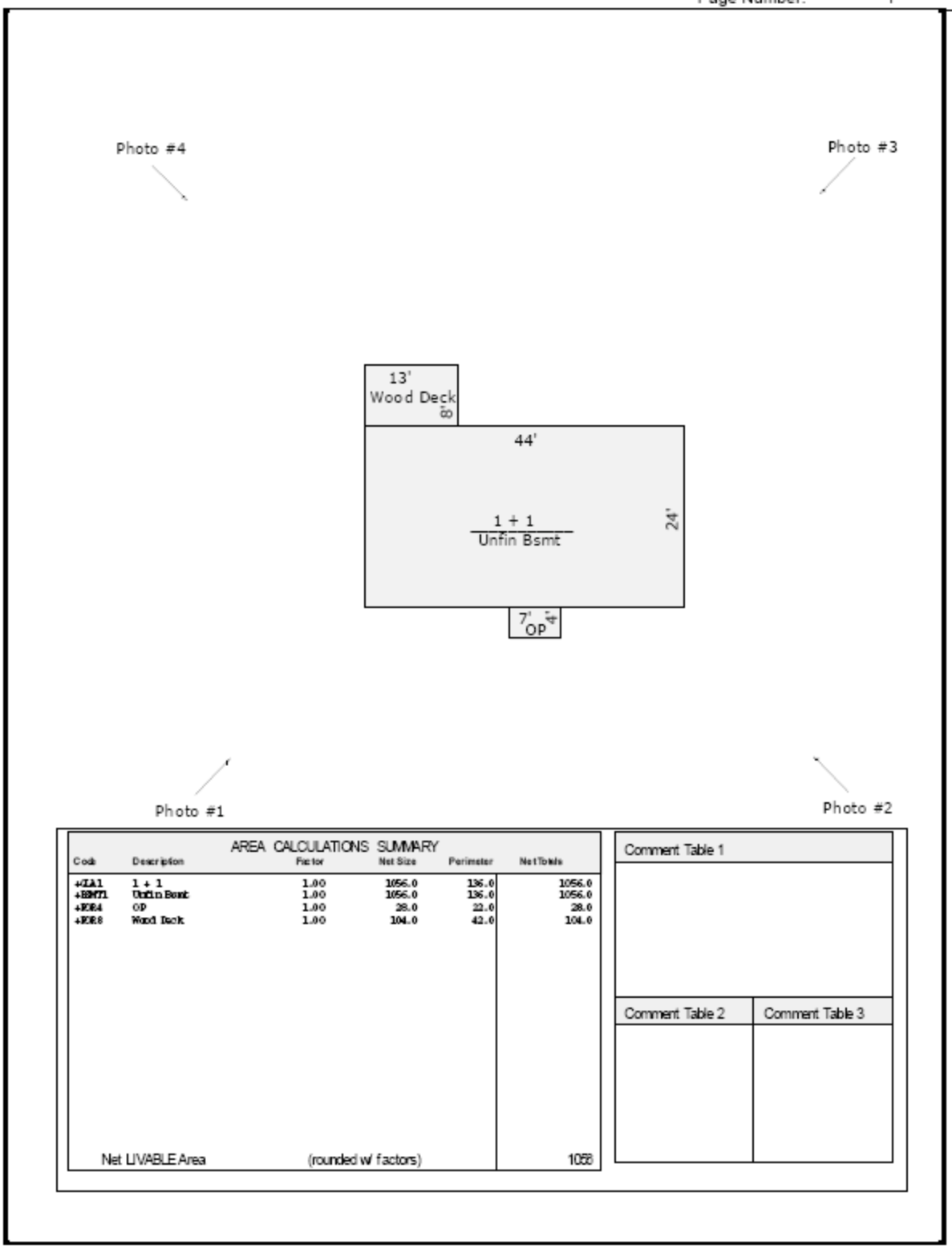
DESCRIPTION: Rear View - Photo #4

DESCRIPTION:

DESCRIPTION:

Property Sketch

County - Sample Number: 27 / 123
Page Number: 1



AREA CALCULATIONS SUMMARY

Code	Description	Factor	Net Size	Perimeter	Net Totals
+LA1	1 + 1	1.00	1056.0	136.0	1056.0
+BMT1	Unfin Bsmt	1.00	1056.0	136.0	1056.0
+OP4	OP	1.00	28.0	22.0	28.0
+WD8	Wood Deck	1.00	104.0	42.0	104.0
Net LIVABLE Area		(rounded w/ factors)			1056

Comment Table 1	
Comment Table 2	Comment Table 3

MARSHALL & SWIFT COST SUMMARY

Number of Buildings on Parcel: ..... COUNTY-SAMPLE NO.: 27 / 123

Parcel No: 10-1.0-01-002-000-999.000	Land Value: $11,300
Address: 12345 Smith Street	Improvement Value: $59,850
City: BOONVILLE	Total Value: $71,150

Residential Type: ☑ Single Family ☐ Low Rise Multiple ☐ Town House End Unit ☐ Town House Inside Unit ☐ Duplex

Style: ☑ 1 Story ☐ 1.5 Story ☐ 2 Story ☐ Bi-Level ☐ Split Level ☐ Mobile Home ☐ Other .....

Construction Class: ☐ C ☑ D | Gross Living Area: 1,056 | Year Built: .....

Quality: ☐ Low ☑ Fair ☐ Average ☐ Good | Condition: ☐ Worn Out ☐ Badly Worn ☐ Fair ☑ Average ☐ Good

Effective Age: 25 | Depreciation: Physical: 33% Functional: ..... External: .....

Exterior Wall: ☐ Hardboard ☐ Metal Siding ☑ Vinyl Siding ☐ Wood ☐ Plywood ☐ Brick Veneer ☐ Other: .....

Roofing: ☑ Composition Shingle ☐ Wood Shake ☐ Metal ☐ Composition Roll ☐ Other: .....

Heating/Cooling: ☑ Warm/Cool Air ☐ Forced Air ☐ Gravity ☐ Electric ☐ Hot Water ☐ Heat Pump ☐ Other: .....

Flooring: ☑ Automatic Allowance ☐ Carpet ☐ Hardwood ☐ Vinyl Sheet ☐ Resilient Floor Cover ☐ Other: .....

Baths: ☑ 1 ☐ 1.5 ☐ 2 ☐ 2.5 ☐ ..... | Subfloor: ☑ Raised Subfloor ☐ Concrete Slab

Fireplace: ☑ None ☐ Single 1-Story ☐ Single 2-Story ☐ Double 1-Story ☐ Double 2-Story

Basement: ☑ Full ☐ Partial ☐ None | Basement Finish: ☐ Partition ☐ Minimal ☑ None

Garage: ☐ Attach ☐ Detach ☐ Basement ☐ Built-In ☐ Carport ☑ None | Garage Stalls: ☐ Single ☐ Double ☐ Other: .....

Contacts: No owner contact, so interior information was estimated to the best of my ability.

Comments: This house sits on the north side of Smith Street in the city of Boonville. The house has a vinyl siding exterior and composition shingles on the roof, both of which appear to be in fair condition. There is a small concrete stoop at the front door and a wood deck on the back of the house. The front yard is small, but there is a nice sized backyard. There really isn't much landscaping here, just a shrub or two.

SALES COMPARISON APPROACH - SITE VALUATION

County-Sample No.: 27 / 123

ITEM	SUBJECT	SALE #1	SALE #2	SALE #3	SALE #4
Situs Address	12345 Smith Street	101 4th Street	123 Main Street	321 Hill Street	
Parcel ID No.	10-10-01-002-000-999.000	05-7 0-35-001-022-111.000	05-7 0-35-004.010-222.000	05-7 0-35-001-022-333.000	
Site Size	75 x 120	61 x 50	65 x 100	48 x 180	
Prox. to Subject		8 Blocks N	8 Blocks NW	9 Blocks N	
Date of Sale		Nov-06	Nov-06	Jul-05	
Sale Price		$5,000	$8,000	$5,500	
Unit of Comp	FF	FF	FF	FF	
SP/Unit		$81.97	$123.08	$114.58	
Unit Size	75.00	61.00	65.00	48.00	
Source:		Assessor	Assessor	Assessor	

Adjustments	Dollar	%	Adj. Applied	±	Dollar	%	Adj. Applied	±	Dollar	%	Adj. Applied	±	Dollar	%	Adj. Applied	±
Sale Price/(SP)			$5,000.00				$8,000.00				$5,500.00					
Prop. Rights	Fee Simple				Fee Simple				Fee Simple							
$ - % - Adj.																
Adjusted SP			$5,000.00				$8,000.00				$5,500.00					
Fin./Mkt. Cond.	Typical				Typical				Typical	2%	$110.00					
$ - % - Adj.						2%	$160.00									
Adjusted SP			$5,000.00				$8,160.00				$5,610.00					
Other:	None				None				None							
$ - % - Adj.																
Adjusted SP			$5,000.00				$8,160.00				$5,610.00					
Adj SP per Unit			$81.97		$125.54				$116.88							
Unit / $	75.00		61.00		$81.97		65.00		$125.54		48.00		$116.88			
Location			Inferior		$25.00		Inferior		$25.00		Inferior		$25.00			
$ - % - Adj.			$25.00				$25.00				$25.00					
Land Size	75 x 120		61 x 50		65 x 100				48 x 180							
$ - % - Adj.																
Use	Residential		Residential		Residential				Residential							
$ - % - Adj.																
Utilities	w.s.e.g		w.s.e.g		w.s.e.g				w.s.e.g							
$ - % - Adj.																
Zoning	Yes		Yes		Yes				Yes							
$ - % - Adj.																
Topography	Level		Level		Level				Level							
$ - % - Adj.																
Flood Plain	No		No		No				No							
$ - % - Adj.																
$ - % - Adj.																
$ - % - Adj.																
$ - % - Adj.																
Adj SP/Unit Size			$106.97				$150.54				$141.88					
Net Adjustments		31%	$25.00			22%	$27.46			24%	$27.29					
Gross Adjust.		31%	$25.00			31%	$27.46			24%	$27.29					

Sales Comparison Approach - Site Valuation - Page 2 | County-Sample No.: | 27 / 123

	Adjusted Price	x	Unit		Value Indication
Basic Land Value	$150.00	x	75.00	=	$11,250.00
Excess Land Value		x		=	
			Total Land Value	=	$11,250.00

Land Value Comments:

The subject property is located in the city limits of Boonville as are all three of the comparable sales. Sale #2 and #3 were given an upward time adjustment as these two sales are from 2005. Each of the three comparable sales were also given an upward adjustment for location. The three sales are located in the central part of the city and the subject property is located in a subdivision therefore, it seemed reasonable to give the adjustment. Otherwise, the three comparables and the subject property have very similar aspects. As indicated by the comparables listed above, the indicated range would be $106.97 to $150.54 per front foot for land in the subjects marketing area.

General and Neighborhood Data Analysis:

The subject property is located on the north side of Weyland Road in the city of Boonville. The city of Boonville is the county seat for Cooper County. The city has approximately 8,202 population and is located on the Missouri River. The city is located on the northern county line just north of Interstate 70 with a small portion of the community located south of Interstate 80. There are other state roads which run into the community which are Highways 87, 5 and 40. Boonville is also located near the middle of the Katy Trail, a 225 mile-long state park enjoyed by cyclists and hikers.

COMPARABLE LAND SALE PHOTOGRAPH SHEET

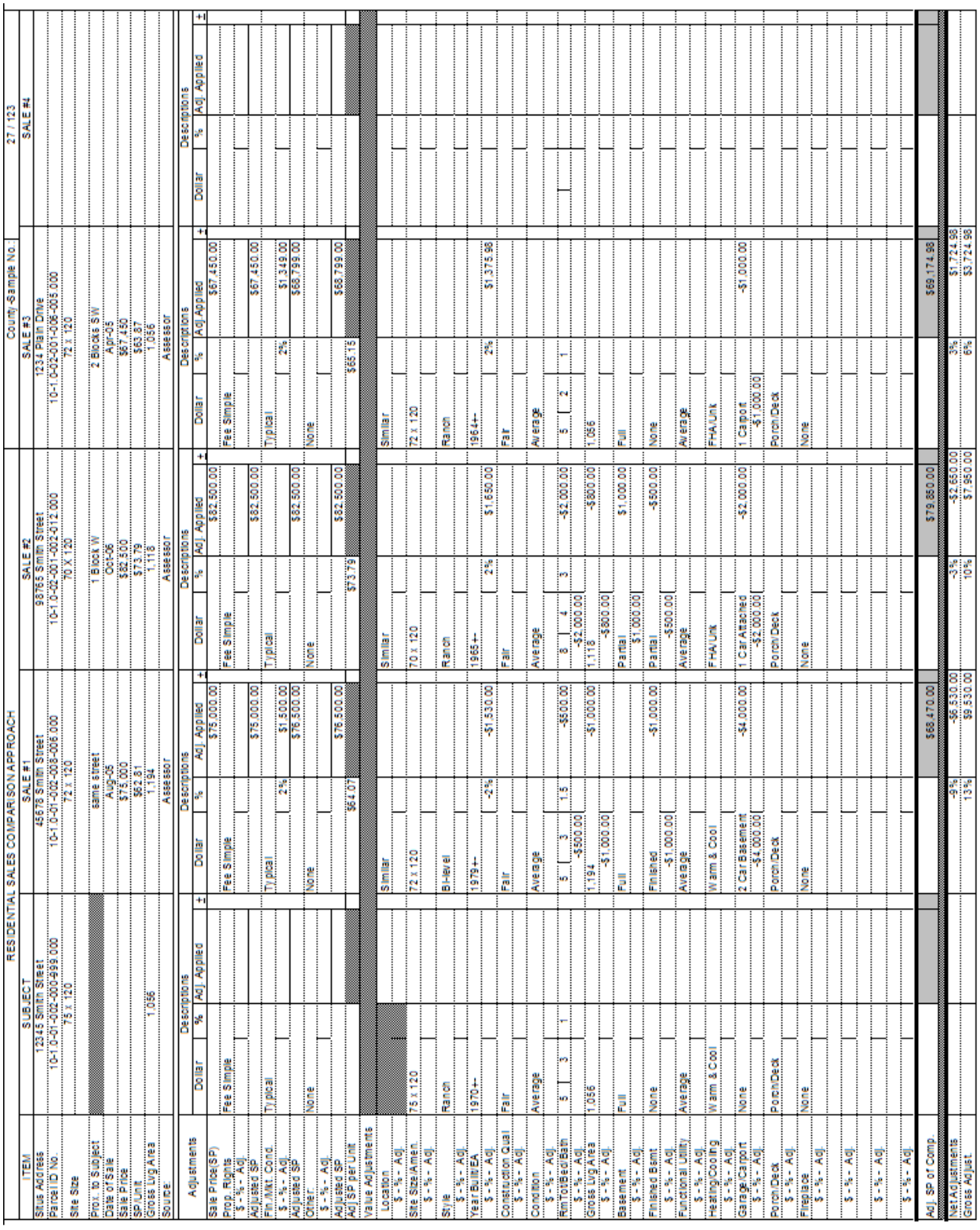
COUNTY-SAMPLE NUMBER: 27 / 123

DESCRIPTION: 101 4th Street

DESCRIPTION: 123 Main Street

DESCRIPTION: 321 Hill Street

DESCRIPTION:


RESIDENTIAL SALES COMPARISON APPROACH
County-Sample No. 27 / 123
ITEM
SUBJECT
12345 Smith Street
10-1-10-01-002-000-999.000
75 x 120
same street
Avg-05
$75,000
$62.81
1,194
Assessor
SALE #1
45678 Smith Street
10-1-10-01-002-008-006.000
72 x 120
Fee Simple
Typical
Bi-level
1970+
Fair
Average
5 3 -$500.00
1,194 -$1,000.00
Full
Finished
None
Average
Warm & Cool
2 Car Basement -$4,000.00
Porch/Deck
None
$76,500.00
$64.07
SALE #2
98765 Smith Street
10-1-10-01-002-012.000
70 x 120
Fee Simple
Typical
Ranch
1958+-
Fair
Average
3 -$2,000.00
1,118 -$800.00
Partial -$1,000.00
Partial -$500.00
Average
FHA/Unk
1 Car Attached -$2,000.00
Porch/Deck
None
$82,500.00
$73.79
$79,860.00
-3%
10%
-$2,650.00
$7,850.00
SALE #3
1234 Plain Drive
10-1-10-02-001-006-005.000
72 x 120
2 Blocks SW
Apr-05
$67,450
$63.87
1,056
Assessor
Fee Simple
Typical
Ranch
1964+-
Fair
Average
5 2 1
1,056
Full
None
Average
FHA/Unk
1 Carport -$1,000.00
Porch/Deck
None
$67,450.00
$1,349.00
$68,799.00
$65.15
2%
$69,174.98
3%
6%
$1,724.98
$3,724.98
SALE #4
Adjustments
Sale Price(SP)
Prop. Rights
$ - % - Adj.
Adjusted SP
Fin./Mkt. Cond.
$ - % - Adj.
Adjusted SP
Other
$ - % - Adj.
Adjusted SP
Adj SP per Unit
Value Adjustments
Location
$ - % - Adj.
Site Size/Amen.
$ - % - Adj.
Style
$ - % - Adj.
Year Built/EA
$ - % - Adj.
Construction Qual
$ - % - Adj.
Condition
$ - % - Adj.
Rm Total/Bed/Bath
$ - % - Adj.
Gross Lvg Area
$ - % - Adj.
Basement
$ - % - Adj.
Finished Bsmt
$ - % - Adj.
Functional Utility
$ - % - Adj.
Heating/Cooling
$ - % - Adj.
Garage/Carport
$ - % - Adj.
Porch/Deck
$ - % - Adj.
Fireplace
$ - % - Adj.
$ - % - Adj.
$ - % - Adj.
$ - % - Adj.
Adj. SP of Comp.
Net Adjustments
Gross Adjust.
-9%
13%
-$6,530.00
$9,530.00
$68,470.00

Residential Sales Comparison Approach - Page 2 | County-Sample No. 27-123

Indicated Value

Adjusted $PSF x Gross Living Area = Value Indication

x = =

Value by Sales Comparison Approach

Land $11,300

Improvement $58,700

Total $70,000

Comparable Sales Comments:

All three comparable sales are within the same general vicinity as the subject property. A time adjustment was given to sale #1 and #3 due to them being 2005 sales. Locations of the comparable sales is very similar to that of the subject property. Sale #1 and #2 are located on the same street as the subject property and sale #3 is on the next street to the south. Lot sizes are almost identical and therefore, no adjustment was deemed necessary at this time. A downward adjustment was given to sale #1 because it is nine years newer than the subject property, whereas, sale #2 and #3 received upward adjustments because they are older than the subject property. Sale #1 was given an adjustment for having one and a half baths and sale #2 received a larger adjustment for having three full baths. Sale #3 was the exact same square footage as the subject property, but sale #1 and #2 received adjustments for the differences in square footage. Sale #2 only has a partial basement and needed an adjustment for this dissimilarity. The most weight is given to sale #3 as it is the most similar to the subject property in lot size, square footage, basement finish and received the least amount of gross adjustments. The above listed comparables indicate a value range of $68,470 to $79,850 for properties in the subject's marketing area.

INCOME APPROACH (IF APPLICABLE)

Estimated Monthly Market Rent $ x Gross Rent Multiplier = $ Indicated Value by Income Approach

Summary of income Approach including support for market rent and GRM) There is insufficient income and expense data in the market for similar properties. Therefore, the Income Approach was not applicable.

General and Neighborhood Data Analysis: If incomplete, refer to site valuation.

COMPARABLE IMPROVEMENT SALE PHOTOGRAPH SHEET
COUNTY-SAMPLE NUMBER: 27 / 123

DESCRIPTION: 45678 Smith Street

DESCRIPTION: 98765 Smith Street

DESCRIPTION: 1234 Plain Drive

DESCRIPTION:

STC Cost Report

Cnty-Sample Number:	027-
County Name:	Cooper
Parcel ID No.:	10-1.0-01-002-
Year Built:	1970+-
Situs Address:	
City:	Boonville
State:	Missouri
Local Cost Code:	65233
Intended User:	State Tax Commission of Missouri
Appraiser:	
Date of Inspection:	4/17/2008
Date of Appraisal:	01/01/2007

Single-family Residence		Floor Area:	1,056 Square Feet
Effective Age:	25	Quality:	2 Fair
Cost as of:	December, 2006	Condition:	3 Average
Style:	One Story		
Exterior Wall:	Frame, Siding, Vinyl 100%		
Plumbing Fixtures:	5		

	Units	Cost	Total
Base Cost	1,056	50.04	52,842
Plumbing Fixtures	5	827.20	4,136
Composition Shingle	1,056	1.65	1,742
Raised Subfloor	1,056	5.99	6,325
Floor Cover Allowance	1,056	2.12	2,239
Warmed & Cooled Air	1,056	4.91	5,185
Plumbing Rough-ins	1	376.00	376
Basic Structure Total Cost	1,056	68.98	72,845
Total Basement Area	1,056	14.10	14,890
Subtotal Basement			14,890
Open Slab Porch	28	5.37	150
Wood Deck	104	14.28	1,485
Subtotal Extras			1,635
Replacement Cost New	1,056	84.63	89,370
Physical + Functional Depreciation 33.0%			29,493
Total Depreciated Cost			59,877
Land			11,250
Non Building			11,250
Total			$71,127
Total, Rounded to Nearest $100			$71,100

Cost data by Marshall & Swift/Boeckh, LLC and its licensors.

Remarks

Marshall & Swift/Boeckh, LLC and its licensors. Residential Estimator 7 - Standard
Estimate: 609
Date Printed: 6/6/2008
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EXHIBIT 4.9
COUNTY MEETING REVIEW FORM

State Tax Commission of Missouri
Ratio Study Section
County Meeting Review Form

County			**Date**
Review Appraiser			**Appraiser**

Sample Number		**Original Value**	
Assessor's Comments			
STC Comments/Conclusions		**Recommended Value**	
Sample Number		**Original Value**	
Assessor's Comments			
STC Comments/Conclusions		**Recommended Value**	
Sample Number		**Original Value**	
Assessor's Comments			
STC Comments/Conclusions		**Recommended Value**	